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T.E. (Mechanical) (Semester – I) Examination, 2010
THEORY OF MACHINES – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be **valued** as a whole.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, if **necessary**.*

SECTION – I

Unit – I

1. a) Derive an expression for frictional torque and load carrying capacity of truncated conical pivot bearing, assuming uniform pressure theory. **8**

b) A centrifugal clutch is to transmit 15 kW at 900 rpm. The shoes are four in number. The speed at which the engagement begins, is $3/4^{th}$ of the running speed. The inside radius of the pulley rim is 150 mm and centre of gravity of the shoe lies at 120 mm from the centre of the spider. The shoes are lined with Feredo for which the coefficient of friction may be taken as 0.25. Determine 1) Mass of each shoe and 2) Size of the shoes, if angle subtended by the shoes at the centre of the spider is 60° and the pressure exerted on the shoe is 0.1 N/mm^2. **10**

OR

2. a) Write a short note on Bevis Gibson torsion type dynamometer. **6**

b) A band and block brake having 12 blocks, each of which subtends an angle of 16° at the centre, is applied to a rotating drum of diameter 600 mm. The blocks are 75 mm thick. The drum and flywheel, mounted on same shaft have a mass of 1800 kg and have a combined radius of gyration of 600 mm. The two ends of the band are attached to pins on the opposite sides of the brake fulcrum at a distance of 40 mm and 150 mm from the fulcrum. If a force of 250 N is applied at a distance of 900 mm from the fulcrum, find

i) The maximum braking torque

ii) The angular retardation of the drum

iii) The time taken by the system to be stationery from the rated speed of 300 rpm.

Take coefficient of friction between the blocks and the drum as 0.3. **8**

c) A bicycle and rider travelling at 12 km/hr on a level road, have a mass of 105 kg. A brake is applied to rear wheel which is 800 mm in diameter. The pressure on the brake is 80 N and the coefficient of friction is 0.06. Find the distance covered by the bicycle and number of turns of its wheel before coming to rest. **4**

Unit – II

3. a) Give the classification of governor. **6**

Explain the working of porter governor.

b) The turbine rotor of a ship has a mass of 30 tons, a radius gyration of 6 mm and rotates at 2400 rpm in a clockwise direction when viewed from aft. The ship pitches through a total angle of 15°, 7.5° above and 7.5° below the horizontal, the motion being simple harmonic and having a period of 12 sec. Determine the maximum gyroscopic couple on the holding down bolts on the turbine and the direction of yaw as the bow rises. **10**

OR

4. a) Explain the following terms related to governor. **6**

   1) Sensitivity of governor

   2) Isochronous governor

   3) Hunting of governor.

   b) A rear engine automobile is travelling around the track of 100 m mean radius. Each of the four road wheels has a moment of inertia of 1.6 kg-m^2 and an effective diameter of 600 mm. The rotating parts of the engine have a moment of inertia of 0.85 kg-m^2, the engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The gear ratio, engine to back axle is 3 : 1. The vehicle has a mass of 1400 kg and its center of gravity is 450 mm above the road level. The width of the track of the vehicle is 1.5 m.

   Determine the limiting speed of the vehicle round the curve for all four wheels to maintain contact with the road surface to avoid skidding of vehicle. **10**

Unit – III

5. Draw the profile of a cam operating a roller reciprocating follower and with the following data : **16**

   Minimum radius of cam = 25 mm. Lift = 30 mm

   Roller diameter = 15 mm

   The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration during the decent period.

   OR

6. a) What is cam jump phenomenon ? **8**

Derive the expression for minimum speed of cam to avoid jump.

b) Write short notes on : **8**

i) Advanced cam curve

ii) Cam with specified counters.

SECTION – II

Unit – IV

7. a) Two spur gear wheels of pitch circle diameter of 100 mm and 350 mm have involute teeth of 5 mm module, and 20° angle of obliquity. The addenda are equal and it is as large as possible while avoiding the interference. If pinion rotates at 100 rpm, find :

i) the addendum,

ii) the contact ratio,

iii) the sliding velocities

a) at the beginning of point of contact,

b) at the end of point of contact. **12**

b) State and prove the law of Gearing. **6**

OR

8. a) A Pair of gears have 14 and 16 teeth and the module pitch is 12.5 mm. The addendum is also 12.5 mm. The angle of obliquity is 14½°. Show that the gears have interference.

Determine the portions by which the addendums of gears must be reduced to avoid interference. Also determine the length of path of contact for the reduced addendum. **10**

b) Define the following terms used in Gears : **4**

i) Pressure angle,

ii) Module,

iii) Addendum,

iv) Arc of contact.

c) Enumerate 4 advantages of involute tooth profile over cycloidal tooth profile. **4**

Unit – V

9. a) Two spiral gear wheels of equal diameters are used to drive a machine tool. The angle between the shaft is 75° and the approximate centre distance is 11.5 cm. Speed of A is 1.5 times the speed of B and normal pitch is 1 cm. If the smaller wheel rotates at 100 rpm, find :

i) the number of teeth on each wheel,

ii) the spiral angle for each wheel,

iii) the rubbing velocity between the teeth. **8**

b) Derive the expressions for various forces acting on bevel gear with neat sketch. **8**

OR

10. a) A three start worm rotating at 1000 rpm, drives a 31 tooth worm gear. Pitch of teeth is 20 mm on a 60 mm pitch diameter. The coefficient of friction is 0.035. Find :

    i) the helix angle of the worm

    ii) the speed of worm gear

    iii) the centre distance,

    iv) the efficiency of the drive

    v) the lead angle for maximum efficiency and corresponding value of efficiency. **12**

    b) Derive the expression for virtual number of teeth of helical gear. **4**

Unit – VI

11. a) Gear wheel A having 14 teeth is rigidly mounted on the driving shaft. It gears with compound wheel B-D. B gears with fixed annular wheel C and D gears with annular wheel E. The compound wheel B-D, revolve freely on a pin. The annular wheel E is rigidly mounted on the driven shaft.

    Module of all the gears is same. The driving and driven shafts and the annular wheels are coaxial. Number of teeth on gear C, E and D are 100, 98, 41. Driving shaft rotates at 1200 rpm and transmits 25 kw power.

    i) Sketch the arrangement

    ii) Find the speed of driven shaft

    iii) Find the torque transmitted by the driven shaft. **12**

    b) Explain the inertia of geared system. **4**

OR

12. a) Explain with neat sketch : **4**

i) Compound Gear Train

ii) Reverted Gear Train.

b) An electric motor drives a machine through a speed reduction gear of ratio 9 : 1. The motor armature with its shaft and gear wheel has a moment of inertia of 0.65 kgm^2. The rotating parts of the driven machine have a moment of inertia of 50 kgm^2. The driven machine has a resisting torque of 100 Nm. Assume no losses in the reduction gear, find :

i) the power rating (in kw) of the motor at a speed of 150 rpm

ii) the time required for the speed of the machine to increase from zero to 50 rpm, when the torque developed by the motor in starting from rest is 30 N-m. **12**

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T.E. (E & TC) (Semester – I) Examination, 2010
(2008 Course)
DIGITAL COMMUNICATION (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What is aperture effect ? What is the effect of pulse duration on aperture effect ? Justify your answer with suitable mathematical analysis. **10**

   b) A signal m(t) bandlimited to 4 KHz is sampled at a rate 50% higher than Nyquist rate. The maximum acceptable error in the sample amplitude is 1% of peak amplitude. The quantized samples are binary coded. Find minimum bandwidth of a channel required to transmit the encoded binary signal. **8**

OR

2. a) Draw the block diagram of DM transmitter and explain its working. Comment on the drawbacks of DM. Explain how the drawback of accumulation of noise is eliminated by Delta-Sigma modulator. **10**

   b) A signal having bandwidth 3 KHz is to be encoded using

      i) 8 bit PCM system

      ii) DM system

   If 10 cycles of the signal are digitized, state how many bits will there in digitized, output in each case if sampling frequency is 10 KHz. Also find bandwidth required in each case. **8**

P.T.O.

3. a) Explain T1 carrier system and AT&T multiplexing hierarchy. **8**

   b) A baseband receiver has received signal amplitude $\pm 2V$ held for a time T. The signal is corrupted by white Gaussian noise having Power Spectral density 10^{-4} volt^2/Hz. If the signal is processed by integrate and dump filter, what should be minimum Time T of the signal so that the error probability is not above 10^{-4}. (Given Q(3.71) = 10^{-4}). **8**

OR

4. a) What is Inter Symbol Interference (ISI) ? Explain the ideal solution to control ISI. **8**

   b) What is bit synchronisation ? Explain closed loop bit synchroniser. **8**

5. a) Define random process. What are Time averages associated with random process ? **8**

   b) Find the mean square value of output random process when a WSS process is passed through an LTI filter. **8**

OR

6. a) What are conditions for a random process to be wide sense stationary ? **8**

   b) If $X(t) = A\cos(2\pi f_c t + \phi)$ is random process with ϕ is a random variable uniformly distributed over $(0, 2\pi)$. Prove that x(t) is ergodic in mean. **8**

SECTION – II

7. a) Explain coherent BPSK transmitter and receiver. Derive the expression for receiver output considering effect of noise. Draw the spectrum of BPSK signal and comment on bandwidth required. **8**

   b) Starting from signal expression of MSK find suitable values of f_H and f_L. **8**

OR

8. a) Write signal expression for QPSK. Draw the block diagram of QPSK transmitter and receiver and explain the working. **8**

   b) What is non-coherent version of BPSK ? Explain with suitable block diagram and waveforms. **8**

9. a) Derive the expression for error probability of BPSK receiver. **8**

   b) Binary data is transmitted using PSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that error probability is less than or equal to 10^{-4}. Assume noise PSD to be 10^{-10} watt/Hz. ($Q(3.71) = 10^{-4}$). **8**

OR

10. a) Calculate the symbol error probability of QPSK receiver. **8**

    b) Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that bit error probability is less than or equal to 10^{-5}. The channel noise PSD is 10^{-8} Watt/Hz. **8**

    Calculate for M = 16 and M = 32

    Given erf (0.99996) = 3.1

    erf (0.99995) = 3.2

11. a) State and explain properties of PN sequence. **6**

    b) The information bit duration in DS-BPSK spread spectrum communication system is 4 ms while the chipping rate is 1 MHz. Assuming an average error probability of 10^{-5} for proper defection of message signal, calculate the jamming margin. Interpret your result. **6**

    Given $Q(4.25) = 10^{-5}$.

    c) Write a short note on radio link budget analysis. **6**

OR

12. a) Explain Frequency Hop Spread Spectrum System (FHSS). How is FHSS advantageous over DSSS ? **6**

    b) What is CDMA ? State its advantages and disadvantages. **6**

    c) Draw block diagram of satellite transponder. Explain the purpose of frequency down converter and TWT. **6**

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T.E. (E & TC) (Semester – I) Examination, 2010
DIGITAL SIGNAL PROCESSING (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be **valued** as a whole.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw the Direct Form – I and II structures for the following systems :
   i) $y[n] = 0.5\left[x[n] + x[n-1]\right]$
   ii) $3y[n] - 2y[n-1] + y[n-2] = 4x[n] - 3x[n-1] + 2x[n-2]$
   iii) $y[n] - 5y[n-1] = 7x[n]$ **12**

1. b) Find the impulse response of an accumulator as described by **6**

$$y[n] = \sum_{k=-\infty}^{n} x[k]$$

OR

2. a) Determine the impulse and the unit step response of the system described by the difference equation
   i) $y[n] = 0.6y[n-1] - 0.08y[n-2] + x[n]$
   ii) $y[n] = 0.7y[n-1] - 0.1y[n-2] + 2x[n] - x[n-2]$ **12**

2. b) Comment on the stability and causality of the following systems **6**
   i) $y[n] = x[-n]$
   ii) $y[n] = \sum_{k=-\infty}^{n+1} x[k]$

P.T.O.

3. a) 4-point DFT of a real time discrete signal $x[n]$ of length 4 is given by $x(k); k = 0;$ 1, 2, 3. It is given that $x(0) = 5 \;\; x(1) = 1 + j1 \;;\; x(2) = 0.5.$ Find $x(3)$ and $x(0)$. **4**

3. b) Consider the following DT system

$$y[n] = \frac{1}{2}x[n-2] + \frac{1}{4}x[n-1] + \frac{1}{4}x[n-3].$$

Find DTFT, magnitude and phase spectra and sketch both. **6**

3. c) Find 4-point DFT of a discrete time sequence {1, 0, 2, 3}. **6**

OR

4. a) The impulse response of the system is given by

$$h[n] = \begin{cases} -2 \;; & n = 1, -1 \\ 4 \;; & n = 2, -2 \\ 0 & \text{otherwise} \end{cases}$$

Find output of the system if the input sequence is $e^{j\frac{n\pi}{2}}$ **6**

4. b) Given $x[k] = \{36, -4 + j9.656, -4 + j4,$
$-4 + j1.656, -4, -4 - j1.656$
$-4 - j4, -4 - j9.656\}$

Using IFFT algorithm. **10**

5. a) An LTI system is characterised by the system function

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Specify ROC of H(z) and determine h(n) for the following conditions

i) The system is stable
ii) System is causal
iii) System is anti causal **6**

5. b) Given the z-transform pair

$$x[n] \xleftrightarrow{z} \frac{z^2}{z^2 - 16} \text{ with ROC } |z| < 4$$

Use transform properties to determine z-transform of the following signals.

i) $y[n] = \left(\frac{1}{2}\right)^n u[n]$ ii) $y[n] = nx[n]$ **6**

5. c) Given the z-transform pair $n^2 3^n u[n] \longleftrightarrow x(z)$ use z-transform properties to determine time domain signals corresponding to the z-transform :

i) $y(z) = x(2z)$ ii) $y(z) = \frac{dx(z)}{dz}$ **4**

OR

6. a) Determine whether each of the following LTI systems
i) Causal, stable ii) Minimum phase

$$H(z) = \frac{1 + 2z^{-1}}{1 + \frac{14}{8}z^{-1} + \frac{49}{64}z^{-2}}$$

$$H(z) = \frac{2z + 3}{z^2 + z - \frac{5}{16}}$$ **6**

6. b) Draw the pole-zero plot and sketch the magnitude response of the system having following transfer function. Also comment on the nature of the magnitude response.

i) $H(z) = \frac{z^{-2}}{1 + \frac{49}{64}z^{-1}}$

ii) $H(z) = \frac{1 + z^{-1} + z^{-2}}{3}$

iii) $H(z) = \frac{0.6 + z^{-1}}{1 + 0.6z^{-1}}$ **10**

SECTION – II

7. a) Design a low pass butterworth filter to satisfy Passband cut off = 0.2π
Stopband cutoff = 0.3π
Passband ripple = 7 dB
Stopband ripple = 16 dB
T = 1 sec. using
impulse invariance method. **8**

b) Derive condition for linear phase for FIR filter. **6**

c) Comment on "causality of Ideal digital filter". **4**

OR

8. a) Design digital butterworth transformation filter using Bilinear transformation $w_p = 0.23\pi$, $w_s = 0.43\pi$, $R_p = 2$, $A_s = 11$, T = 1 sec. **8**

   b) Discuss design steps of IIR filter using Bilinear transform method. How frequency response is obtained ? **6**

   c) Using Impulse invariance method design IIR filter given :

   $$H(s) = \frac{2}{s+2}, \quad F_s = 1000 \text{ samples/sec.}$$ **4**

9. a) Draw and explain polyphase interpolator (assume I = 3). **6**

   b) With the aid of block diagram and mathematical support explain sampling rate conversion by rational factor I/D. **6**

   c) What is sampling rate conversion ? **4**

   OR

10. a) Explain decimation by factor 'D'. Write expression for decimated signal at the output. **8**

    b) Explain any two applications of multirate sampling. **8**

11. a) Compare DSP processor with conventional microprocessor architectures. What is the use of DAG 1 and DAG 2 ? List the number of internal buses and memory pointer registers used in TMS67XX. **10**

    b) What are desirable features of digital signal processor ? **6**

    OR

12. a) Explain in brief the following functional units : **10**
    i) Barrel shifter
    ii) MAC

    b) Draw architectural block diagram of DSP processor and explain function of each block. **6**

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T.E. (Instrumentation & Control) (Semester – I) Examination, 2010
INSTRUMENTATION FOR CHEMICAL ANALYSIS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) What are the advantages and disadvantages of Instrumental methods over Classical methods ? **8**

   b) Enlist various electroanalytical methods. Explain any one in detail. **8**

   OR

2. a) Explain principle and instrumentation used for coulometry. **8**

   b) Draw electromagnetic spectrum. Also list one instrumental method, one source and one detector for each region. **8**

3. a) With a neat diagram, explain working and principle of atomic absorption spectrophotometer. **10**

   b) Explain principle and working of UV-visible spectrophotometer. **8**

   OR

4. a) What is sputtering ? With a neat diagram, explain working of Hollow Cathode Lamp. **10**

   b) State and derive Beer-Lambert's law. **8**

5. a) Explain Inductively Coupled Plasma (ICP), with the help of neat diagram. **8**

   b) With a neat diagram, explain working and principle of flame photometer. **8**

   OR

6. a) Enlist various IR detectors and sources and explain any one of them in detail. **8**

   b) With neat diagram, explain working of FTIR spectrometer. **8**

P.T.O.

SECTION – II

7. a) What is Raman effect ? Explain construction and working of Raman Spectrometer. **8**

   b) Explain how does sensitivity enhancement is achieve in NMR spectrometer. **8**

OR

8. a) Explain N_2 and CO_2 Gas analyzer. **8**

   b) What is fluorescence and with neat diagram, explain spectroflurometer ? **8**

9. a) Explain working of gas chromatography and give ideal characteristics of carrier gas. **10**

   b) Explain the block diagram of mass spectrometry and discuss time of flight mass analyser. **8**

OR

10. a) With the help of neat diagram explain HPLC and also explain one HPLC detector. **10**

    b) Enlist various mass spectrometer detectors and explain electron capture detector. **8**

11. a) Enlist various radiation detectors and explain scintillation counter. **8**

    b) Explain Auger Emission spectroscopy and required instrumentation. **8**

OR

12. a) State and prove Bragg's law of diffraction. **8**

    b) Explain GM counter. **8**

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T.E. (Petroleum) (Semester – I) Examination, 2010
DRILLING OPERATIONS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) With the help of proper figure, describe the basic components of a drill string and discuss grades and classification of drill pipe used to drill the well. **6**

   b) If ABCD are four legs of derrick, draw works is between leg C and leg D, dead weight anchor near to leg A. Discuss distribution of load on each leg. **6**

   c) A diesel engine gives an output torque of 1740 ft-lb an engine speed 1200 rpm. If fuel consumption rate was 31.5 gal/hr. What is the output power and overall efficiency of engine. If fuel having value 19000 btu/lb. **6**

OR

2. a) Discuss advantages and disadvantages of top drive system in brief. **4**

   b) Describe hoisting system of a drilling rig in details. **8**

   c) A rotary rig is equipped with 1200hp, draw works efficiency of the hoisting system is 81%. Determine the time it takes to pull one stand at hook load of 300000 lbs 1 stand = 93 ft. **6**

P.T.O.

3. a) Discuss bit selection criteria in detail. **8**

   b) A double acting duplex pump with 2.5 inch rod and 20″ stroke is to be operated at 60 SPM for drilling 10,000 ft. The maximum available pump hydraulic horse power is 1360 hp. The pump delivery pressure recommended for optimum hydraulics is 3423 PSi. Determine linear size (efficiency of pump = 92%). **4**

   c) Find out inside and annulus capacity bbl/ft of drill pipe and drill collar using following data. **4**

   Drill pipe O.D. = 5 inch I.D. = 4.276 inch

   Drill Collar O.D. = 8 inch I.D. = $2-\frac{13}{16}$ inch

   Open hole = 12.25 inch

OR

4. a) Discuss dull bit gradation in brief. **4**

   b) Discuss bit type if IADC code is 5 – 3 – 7. **2**

   c) Discuss remedial measures for the following down hole problems **2**

   i) Bit balling ii) Shale instability due to caving

   d) Determine magnitude of differential sticking force across a permeable zone of 9.1 m, differencial pressure = 1000 PSi thickness of filter cake = 12.7 mm, friction factor = 0.1. **2**

   e) Discuss different types of ram preventors. **6**

5. a) Discuss different types of horizontal wells. **3**

   b) Discuss fulcrum, Pack off, Pendulum assembly used in directional drilling. **3**

   c) Convert decimal degree to DMS 46.3667°. **2**

   d) Discuss any one external catching fishing tool with suitable sketch. **8**

OR

6. a) Discuss different types of multilateral wells level 1 to level 6 in brief. **8**

   b) Discuss different uses of core and conventional coring method in brief. **8**

SECTION – II

7. a) Write different types of casing with appropriate casing size, hole size and bit size. **6**

   b) A light cement which develops good compressive strength can be made by blending one part of light weight cement with one part of class H cement. Calculate the water requirement for slurry at a weight of 13.6 ppg. **4**

   Data given : Light weight cement 75 lbs absolute volume 0.0429 gal/lb

   Class H cement 94 lbs absolute vol. 0.0382 gal/lb water 8.33 ppg.

   c) Discuss balance plug method of cementation in brief. **5**

   d) A 10,000 ft, 7" casing is tobe cemented in an 8.5" hole, if mud density is 13.4 ppg, S.water = 8.33 ppg. Calculate volume of water spacer ahead of cement which causes 300 PSi reduction in hydrostatic pressure in annulus. **3**

OR

8. a) Discuss two stage cementation and indicate different features of it. **8**

   b) Determine the following : **10**

   i) How many sacks of lead cement will be required ?

   ii) How many sacks of Tail cement will be required ?

   iii) How many barrels of mud will be required to displace the plug ?

   iv) How many strokes will be required to bump the top plug ?

   Data given as

   Casing setting depth = 3000 ft Hole size = 17.5 inch

   Casing size = 13 – 3/8 inch casing I.D. = 12.615 inch

   Shoe track (float collar to float shoe) dist = 44 ft

   Pump discharge = 0.112 bbl/stroke

   Cement Program :

   Lead cement 13.8 ppg = 2000 ft, slurry yield = 1.5 g ft^3/sack Tail cement 15.8 ppg = 1000 ft, slurry yield = 1.15 ft^3 /sack

   Excess volume for both = 50%.

9. a) Discuss different types and functions of drilling fluid in brief. **8**

   b) Determine the amount of weighing material with sp.gr. 4.25 that must be added to a mud system to increase its pressure gradient from 0.52 PSi/ft to 0.624 PSi/ft. Initial volume of mud = 50 m^3. **6**

   c) Write note on 'gel strength' in brief. **2**

OR

10. a) Discuss different mud conditioning equipments in brief. **8**

    b) Calculate bottom hole pressure in PSi if well depth is 1500 m, mud weight = 12.2 PPg. **2**

    c) Find gradient if pressure = 1250 PSi and 2000 PSi. **2**

    d) Discuss different rheological properties in brief. **4**

11. a) Draw circulation diagram and discuss different pressure losses in the system. **8**

    b) A 13 PPg mud is flowing at 500 gpm through a jet bit find hydraulic horse power expended across the bit for nozzle set 12 – 12 – 12. **6**

    c) Discuss ECD in brief. **2**

OR

12. a) What is hydraulics ? Discuss different properties and optimization of hydraulics in brief. **8**

    b) Well data : **8**

    Depth – 2350 M, Hole size 12.25 inch, Mud weight = 10.8 PPg
    Plastic viscocity = 18 cp Yield point 22 lb/100 ft^2
    Nozzle size 16, 16, 16 TFA 0.5890 sq. inch
    Pump pressure 2220 PSi flow rate 600 GPM
    Annularpressure loss = 44.3 PSi
    Total system pressure loss = 1188 PSi
    Calculate :

    i) Bit hydraulic horse power ii) % HHP

    iii) Nozzle velocity iv) ECD.

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T.E. (Printing) (Semester – I) Examination, 2010
PRINTING NETWORK TECHNOLOGY AND OPTO ELECTRONICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Section – **I** Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Section – **II** Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*
*2) Answer **any 3** questions from **each** Section.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. A) What is pulse width modulation ? Explain F.M. in details. **8**
   B) Explain role of optoelectronics in Printing Technology. **8**

OR

2. A) Explain quantization and its types. **8**
   B) What do you mean by modulation ? Explain pulse code modulation. **8**

3. A) Explain data encryption and decryption. **10**
   B) Explain the losses in fiber optic cable with suitable diagrams. **8**

OR

4. A) Draw and explain block diagram of basic fiber optic communication system. **10**
   B) Explain Time Division Multiplexing (TDM). **8**

5. A) Explain smart ticket application using RFID. **8**
   B) Explain sheet thickness measurement application. **8**

OR

6. A) Explain Wi-Fi technology. **8**
   B) Explain any one application of RFID in field of printing in detail. **8**

P.T.O.

SECTION – II

7. A) Explain any four types Operating System (OS). **8**

   B) Explain any four UNIX commands. **8**

OR

8. A) Explain directory structure of UNIX. **8**

   B) Write short note on MAC operating system. Explain different features of MAC Operating System. **8**

9. A) Explain different types of network and their network topologies. **10**

   B) Write short note **(any two)** : **8**

      1) SMTP
      2) HTTP
      3) IMAP

OR

10. A) State and explain different design issues for the layer structure. **10**

    B) Explain File Transfer Protocol (FTP) in detail. **8**

11. A) Explain what is ISDN. **8**

    B) Write short note **(any two)** : **8**

       1) Gateways
       2) Bridges
       3) Routers.

OR

12. A) Write short note **(any two)** : **8**

       1) Modems
       2) Repeaters
       3) Hubs.

    B) Explain VOIP and VAN. **8**

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[3863] – 312

T.E. (Mechanical) (Semester – I) Examination, 2010
HEAT TRANSFER (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) Explain Fourier's Law of heat conduction. **4**

   b) Explain variation of thermal conductivity in solids and liquids with temperature giving out reasons. **4**

   c) A steel tube with 5 cm ID and 7 cm OD (k = 28 W/mK), is covered with an insulation covering of thickness 15 mm (k = 0.2 W/m°C). A hot gas at temperature of 400° C with convective heat transfer coefficient of 300 W/m^2K flows inside the tube. The outer surface of insulation is exposed to cold air at - 5°C with h = 20 W/m^2 °C. Calculate heat flow rate from the pipe and the interface temperature between steel and insulation. **8**

OR

2. a) Derive general heat conduction equation in Cartesian coordinates for 3-dimensional unsteady state heat flow for an-isotropic material with uniform internal heat generation using standard notations. **8**

P.T.O.

b) A spherical storage of steel of 20 cm ID and 30 cm OD (k = 50 W/mK) stores liquid oxygen, due to which its inside surface temperature is maintained at – 150°C. Outside surface is exposed to ambient air at 20°C with convective heat transfer coefficient of 10 W/m^2K. Determine heat transfer rate. What shall be the percentage decrease in heat transfer rate, if the steel sphere is applied with layer of insulation (k = 0.5 W/m°C) of 25 mm thickness on its outside surface ? **8**

Unit – II

3. a) Inner surface of radius $r = r_1$ and the outer surface of radius $r = r_2$ of a hollow cylinder are maintained at uniform temperatures of T_1 and T_2. Thermal conductivity of the cylinder material k is constant. Develop expressions for one dimensional steady state temp. distribution $T_{(r)}$, heat flow rate Q and thermal resistance R. **8**

b) A furnace wall is made of layers of fire clay of 100 mm thickness (k = 0.9 W/mK) and red brick of 200 mm thickness (k = 0.6 W/m°C). Space between these two layers of 60 mm width (k = 0.1 W/mK) is filled with normal mud. What should be the thickness of red brick layer, if the furnace wall is to be made without mud layer to keep the heat flow rate same with same temperatures of inside and outside surfaces ? **8**

OR

4. a) "While insulating a small diameter electric conductor, aim was to increase the heat transfer rate. However, it was found on measurement that heat transfer rate has in fact decreased." – Justify. **4**

b) Derive expression for critical radius of insulation for a sphere using standard notations. **4**

c) A metal slab of 2 cm thickness (k = 25 W/mK) generates internal heat energy at a uniform rate of 10^8 W/m^3. One face of this slab is insulated and the other face is maintained at 300° C due to its exposure to a fluid. Determine maximum temperature in the slab and its location. Also, find out total heat flow out (rate) from the slab. **8**

Unit – III

5. a) Starting from boundary conditions, derive the expressions for temp distribution along the length and heat flow rate for a very long fin using standard notations. **9**

   b) An electric motor 300 mm long dissipating heat at a rate of 350 W is required to be fitted with plate fins radially outwards so that motor surface temperature does not exceed 50°C. Plate fins are 15 mm thick of 50 mm length (height from motor surface) with k = 40 W/m°C. Motor is exposed to atmosphere at 25° C with convective heat transfer coefficient of 20 W/m^2K. Determine number of fins required neglecting convection from tip of fins. Ignore heat convection from unfinned area of motor's outer surface. **9**

OR

6. a) Explain :

   i) Biot Number

   ii) Fin Efficiency

   iii) Fin Effectiveness. **9**

   b) A solid brass sphere 20 cm diameter initially at a temp of 200° C is suddenly exposed to air stream at – 10° C with a convective heat transfer coefficient of 50 W/m^2K. Find the time required by the sphere to attain temperature of 0°C. If brass sphere is replaced by copper sphere, what percent increase or decrease in time will occur to attain the same temperature of 0°C ? Properties are :

   Copper : density = 7,670 kg/m^3; c = 0.372 kJ/kg°C; k = 370 W/mK

   Brass : density = 8,552 kg/m^3; c = 0.385 kJ/kg°C; k = 100 W/mK. **9**

SECTION – II

Unit – IV

7. a) Explain :

i) Lambert Cosine Law

ii) Solid angle

iii) Shape factor of a body with respect to itself

iv) Emissivity. **8**

b) A pipe carrying steam having an outside diameter of 20 cm passes through a large room and is exposed to air at temp of 30°C. Pipe surface temp is 200° C. Find the total heat loss per meter length of pipe both by convection and radiation taking emissivity of the pipe surface as 0.8.

Use the relation : $Nu = 0.53\ (Ra)^{0.25}$ for horizontal pipe

Temp °C	**K (W/mK)**	**V × 10^6 (m^2/s)**	**Pr**
30	0.0267	18.60	0.701
115	0.0330	24.93	0.687
200	0.0393	26.00	0.680

8

OR

8. a) Prove that heat exchange between two grey body eccentrically placed cylinders (one enclosed by the other) is given by :

$$Q = \frac{\sigma . A_1 . \left(T_1^4 - T_2^4 \right)}{\frac{1}{\varepsilon_1} + \frac{A_1}{A_2}\left(\frac{1}{\varepsilon_2} - 1 \right)}$$; where T_1 and T_2 are the temps of areas of cylinders A_1 and A_2 facing each other, A_1 enclosed in A_2 and space between them evacuated; ε_1 and ε_2 are the respective emissivities. **8**

b) Two large parallel plates (Grey bodies) are maintained at temperatures of 600° C and 300°C having their emissivities of 0.9 and 0.4 respectively. A radiation shield having emissivity of 0.02 is inserted in between them. Calculate :

i) Heat transfer rate without radiation shield

ii) Heat transfer rate with radiation shield

iii) Temperature of shield. **8**

Unit – V

9. a) Write short notes :

i) Hydraulic diameter.

ii) Thermal boundary layer for fluid flow over flat plate. **8**

b) A circular disc of diameter 25 cm is exposed to air at 293 K. If the disc is maintained at 393 K, estimate the heat transfer rate from it, when;

i) Disc is kept horizontal (Take characteristic length = Area/Perimeter)

ii) Disc is kept vertical.

For air at 70°C, k = 0.03 W/mK; Pr = 0.697; v = 2.076×10^{-6} m^2/s

Use the following correlations :

$Nu = 0.14 (Ra)^{0.334}$ for surface facing upward

$Nu = 0.27 (Ra)^{0.25}$ for surface facing downward

$Nu = 0.59 (Gr.Pr)^{0.25}$ for vertical surface. **8**

OR

10. a) Explain the significance of the following :

i) Nusselt Number

ii) Grashoff Number

iii) Prandtl Number

iv) Peclet Number. **8**

b) 4800 kg/hr of water is heated from 30°C to 60°C by passing through a square duct of 30 mm × 30 mm. The duct is heated by condensing steam at 100°C on its outer surface. Find the length of the duct required.

Take properties of water : Density = 995 kg/m^3; $\mu = 7.65 \times 10^{-4}$ kg / ms ; C_p = 4.174 kJ/kgK; k = 0.623 W/m°C; Conductivity of duct material = 24 W/mK.

Use : Nu = 0.023 $Re^{0.8}$ $Pr^{0.4}$ for turbulent flow

Nu = 4.36 for laminar flow. **8**

Unit – VI

11. a) Explain the following :

i) LMTD

ii) NTU

iii) Heat exchanger effectiveness. **9**

b) A chemical (specific heat = 3.2 kJ/kgK) enters a parallel flow heat exchanger at 150°C at a flow rate of 30,000 kg/hr. Cooling water (specific heat = 4187 J/kgK) enters the heat exchanger at 20°C at a flow rate of 1000 kg/min. Heat transfer area of the heat exchanger is 12 m^2. Over all heat transfer coefficient can be taken as 1000 W/m^2K. Find the effectiveness of the heat exchanger and outlet temperatures of both chemical and water. **9**

OR

12. a) Explain six regimes of pool boiling curve. **9**

b) Name any three convective heat transfer augmentation techniques known to you an explain working principle of any one. **5**

c) Explain filmwise and dropwise condensation. **4**

[3863] – 373

T.E. Electronics (Semester – I) Examination, 2010
(2008 Pattern)
NETWORK SYNTHESIS AND FILTER DESIGN
(New)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Test the given polynomials for Hurwitz
   i) $P(s) = s^7 + 3s^5 + 2s^3 + s$
   ii) $P(s) = s^3 + 4s^2 + 5s + 4$. **10**

   b) Define Network function and explain role of realizability, causality and stability. **6**

OR

2. a) Give the properties of Positive real function and check the given function for p.r.f.

$$H(s) = \frac{(s+2)}{(s^2+3s+2)}$$ **6**

   b) What is elementary synthesis procedure. Synthesize the following function by removal of poles

$$Z(s) = \frac{(s^2+1)(s^2+9)}{s(s^2+4)}$$ **10**

P.T.O.

3. a) Synthesize functions given below in one Foster and one Cauer form

   i) $Z(s) = \dfrac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$

   ii) $Z(s) = \dfrac{(s^3+2s)}{(s^4+4s^2+3)}$. **12**

   b) State and explain the properties of RC impedance or RL admittance function. **6**

OR

4. a) Identify the following function as RC, RL, LC function and obtain one Cauer and one Foster form

   i) $Z(s) = \dfrac{(s+1)(s+4)}{s(s+2)}$

   ii) $Z(s) = \dfrac{2(s+1)(s+3)}{(s+2)(s+6)}$. **12**

   b) State and explain the properties of LC driving point impedance function. **6**

5. a) Realize the following function

   $H(s) = \dfrac{s^4}{(s^2+1)(s^2+3)}$. **8**

   b) Synthesize the voltage ratio :

   $\dfrac{V_2}{V_1} = \dfrac{(s+2)(s+4)}{(s+3)(3s+4)}$. **8**

OR

6. a) Synthesize the following transfer function with 1Ω termination

   i) $\dfrac{V_2}{V_1} = \dfrac{s^2-s+1}{s^2+s+1}$

   ii) $Z_{21}(s) = \dfrac{s^2}{s^3+3s^2+4s+2}$. **8**

   b) Derive expression for transfer function of Bridge T network with constant resistance and prove that $R_2 = Z_1 Z_2$. **8**

SECTION – II

7. Design passive 3rd order Butterworth Band Pass filter with following specification :
   i) Stop band ω <= 30 Krad/sec and ω >= 120 Krad/sec
   ii) Pass band 50 Krad/sec < ω < 72 Krad/sec. **16**

   OR

8. Synthesize a Chebyshev LPF with following specification :
   i) Load resistance 500 Ω
   ii) 1 dB ripple with pass band
   iii) Cut off frequency 3×10^5 rad/sec
   iv) at 9×10^5 rad/sec down is 15 dB. **16**

9. a) Determine the transfer function for the positive feedback bi-quad circuit given below in terms of feed forward and feedback transfer function assuming ideal Op-Amp. (See fig. 1) **10**

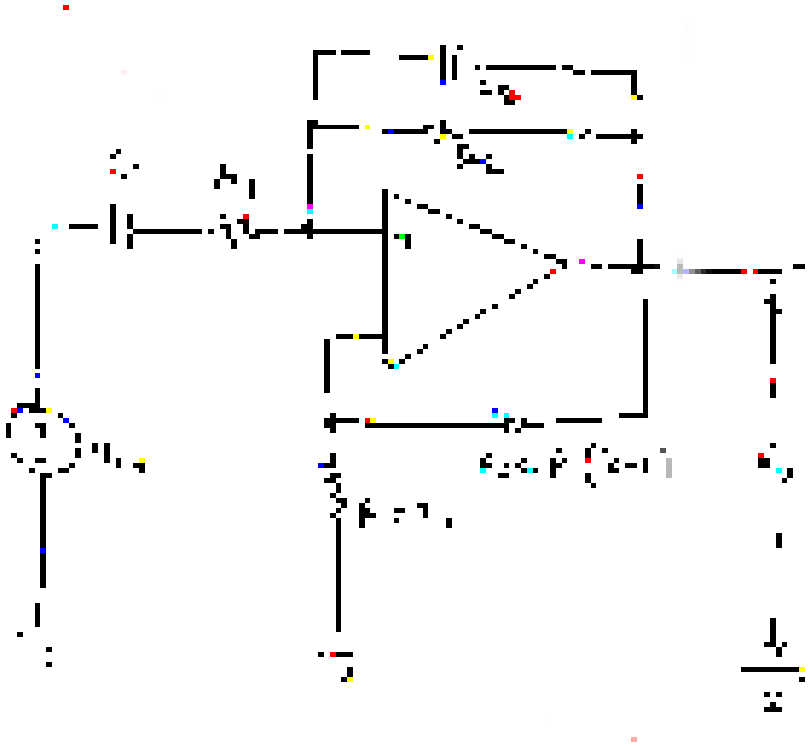

Fig. 1

   b) Explain frequency scaling and impedance scaling with suitable example. **6**

   OR

10. Consider 2nd order Sallen and Key filter with k = 2, $R_1C_1 = R_2C_2$ and C_1 = 1F. Determine design equation for R_1,R_2,C_1 and C_2 in terms of ω_0 and Q. Synthesize using ω_0 = 1000 rad/sec and Q = 10. **16**

11. a) Synthesize a 2nd order LPF to have pole frequency 2 KHz and Pole Q is 10. Also compute the component sensitivities for the filter (use Sallen and Key circuit). **10**

    b) Explain effect of following Op Amp characteristic on the active filter response : **8**

    i) Input Offset Voltage
    ii) Slew rate
    iii) Input bias current
    iv) Dynamic range. **8**

OR

12. a) For Sallen and Key 2nd order Low Pass Filter, if $R_1 = 1\Omega$, $R_2 = 1\Omega$, $C_1 = 2Q$ and $C_2 = 1/2Q$ then for transfer function

$$H(s) = \frac{K}{s^2 + (1/Q)s + 1}$$

find sensitivities for Q with respect to all passive component. **8**

    b) Write short note on (**any two**) :

    i) ω and Q sensitivity
    ii) Gain enhancement in active filter
    iii) Simulated inductance technique for active filter realisation. **10**

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T.E. (E&TC) (Semester – I) Examination, 2010
(2008 Course)
NETWORK SYNTHESIS AND FILTER DESIGN (NSFD) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the concept and physical significance of poles and zeros. **6**

   b) Find current ratio transfer function $\frac{I_2}{I_1}$ for the network shown in the Figure 1. **6**

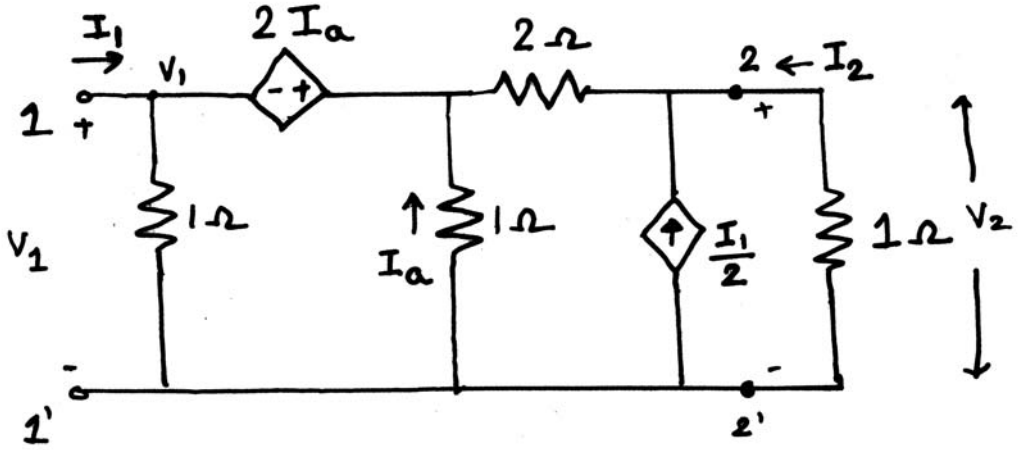

Figure 1

P.T.O.

c) Test whether $F(s) = \frac{s^2 + 1}{s^3 + 4s}$ is a positive real function. **6**

OR

2. a) What is a positive real function ? State the necessary and sufficient conditions for a function to be a positive real function. **6**

b) For the network shown in figure 2, the transfer admittance function is given by $Y_{21}(s) = \frac{I_2(s)}{V_1(s)} = \frac{K(s+1)}{(s+2)(s+4)}$. Find out K. **6**

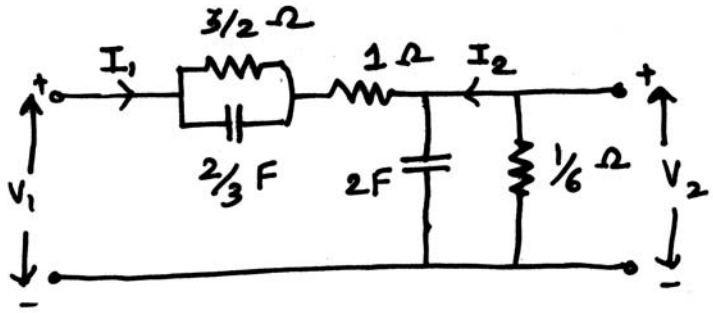

Figure 2

c) Using ladder analysis. Find the voltage transfer ratio $\frac{V_o(s)}{V_{in}(s)}$ for the network shown in figure 3. Plot the pole zero diagram. **6**

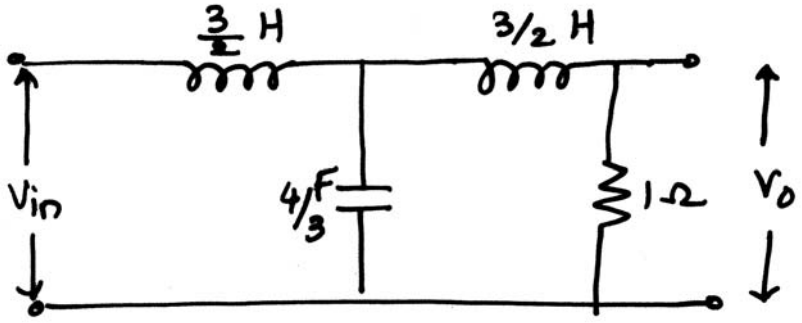

Figure 3

3. a) State the properties of RLC driving point functions and explain its synthesis procedure. **6**

   b) Obtain the Foster I and Foster II form of the following impedance function.

$$Z(s) = \frac{(s^2+1)(s^2+9)}{s(s^2+4)}$$ **10**

OR

4. a) Of the two pole zero diagrams shown in the figure 4, pick the diagram representing a RL impedance function and synthesize by Foster I form. **6**

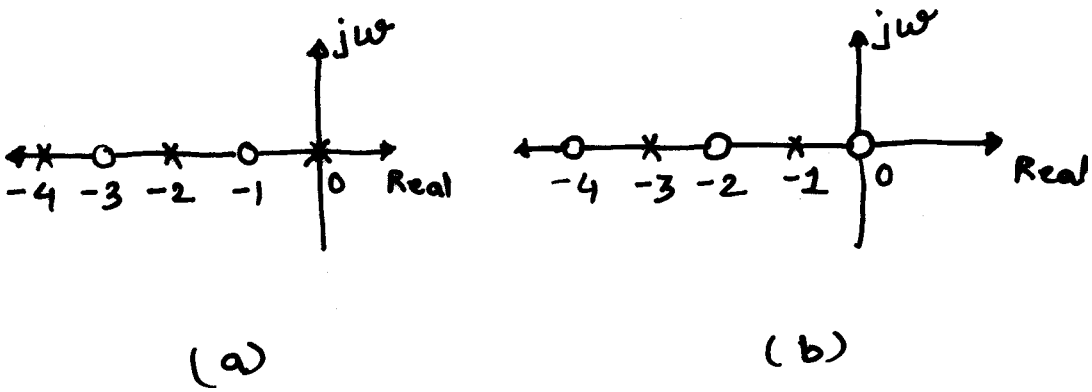

Figure 4

   b) State the properties of RC impedance function. Synthesize the following impedance function using both the cauer forms. **10**

$$Z(s) = \frac{(s+1)(s+4)(s+8)}{s(s+2)(s+6)}$$

5. a) State the properties of transfer function. Obtain the transfer function of a two port terminated network in terms of '3' parameters. **6**

   b) Realize the following voltage ratio transfer function in terms of constant resistance lattice network terminated in 1Ω. **6**

$$\frac{V_2}{V_1} = \frac{s^2 - s + 1}{s^2 + s + 1}$$

   c) Identify the zeros of transmission for the network shown in figure 5. **4**

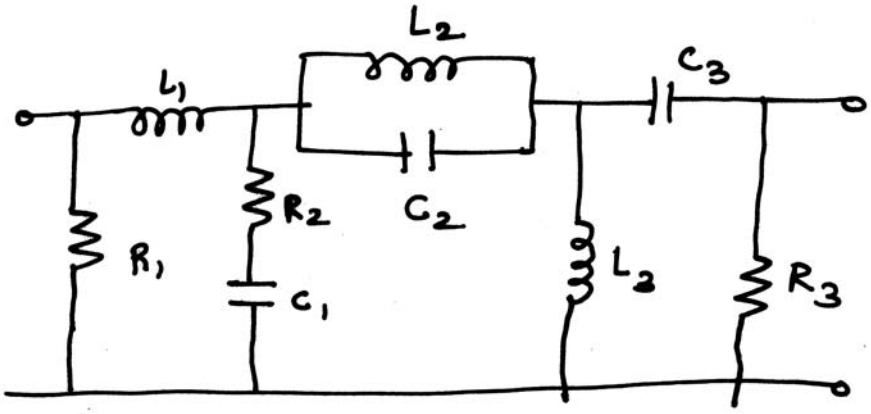

Figure 5

OR

6. a) Explain the concept and significance of zeros of transmission in network synthesis. **4**

   b) Synthesize open circuit voltage ratio transfer function.

$$\frac{V_2}{V_1} = \frac{1}{(s+2)(s+5)}$$

   using RC ladder networks. **6**

c) Synthesize the voltage ratio

$$\frac{V_2}{V_1} = \frac{s^2 + 1}{s^2 + 2s + 1}$$

as a constant resistance bridged T network terminated in 1Ω resistance. **6**

SECTION – II

7. a) Write a short note on frequency transformation. **6**

b) Find out the transfer function of a normalized low pass butterworth filter for n = 3 i.e. third order filter. Plot the pole plot of this filter. **6**

c) Design and realize a Chebyshev filter to meet the following specifications.

i) Maximum passband ripple attenuation of 1 dB.

ii) Cut off frequency $\omega_c < 1.2$ rad/s.

iii) Stop band attenuation of at least 40 dB for $\omega \geq 4$ rad/s. **6**

OR

8. a) Realize the network for a third order low pass butterworth filter. **6**

b) What is magnitude and frequency scaling ? Explain its significance. **6**

c) A low pass filter is shown in figure 6. Convert this filter into a high pass filter with cut off frequency of 10^6 rad/s and impedance level of $500\ \Omega$. **6**

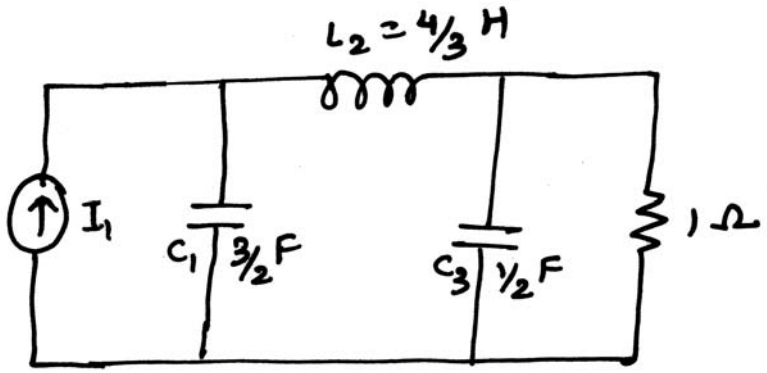

Figure 6

9. a) Write a short note on : **8**

   i) FDNR

   ii) Gyrator.

   b) Synthesize a second order low pass butterworth filter to have a cut off frequency of 159.15 Hz. Then using RC – CR transformation realize high pass filter with same cut off frequency. **8**

OR

10. a) Explain with suitable example the coefficient matching technique for obtaining element values. **8**

    b) Synthesize the following transfer function using positive feedback circuit. **8**

$$T(s) = \frac{20{,}000}{s^2 + 100s + 10000}$$

11. a) The active RC circuit shown in figure 7 realizes a second order high pass function. Find its transfer function v_o/v_{in} and derive expressions for the sensitivity of

i) ω_p to the elements R_1, R_2, C_1, C_2.

ii) Q_p to R_1 and amplifier gain A. **12**

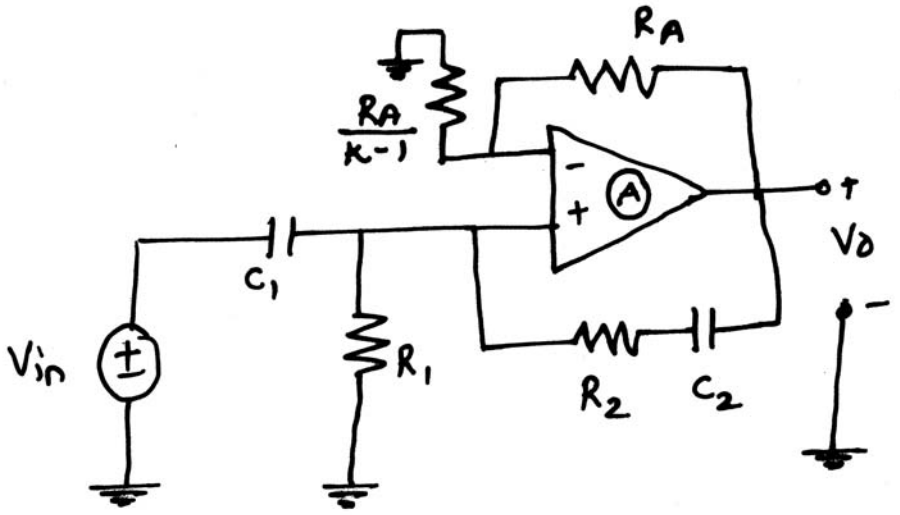

Figure 7

b) Explain the effect of slew rate and dynamic range of op-amp on active filter performance. **4**

OR

12. a) What is multielement deviation ? Define variability and derive the expression for per unit change in parameter P due to simultaneous variations in all elements. **10**

b) Explain briefly the effect of op-amp frequency characteristics on the performance of an active filter. **6**

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[3863] – 404

T.E. Chemical (Semester – I) Examination, 2010
CHEMICAL PROCESS TECHNOLOGY (New)
(2008 Course)

Duration : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain with schematic representation and applications any four types of unit operations and unit processes. **8**

   b) Discuss the production of sodium carbonate with neat diagram. **8**

   OR

2. a) Discuss recovery of Mg salts from sea water. **8**

   b) Describe the procedure for NaOH and Cl_2 production with major engineering problems. **8**

3. a) Discuss production of urea with its engineering problems. **8**

   b) Explain production of sulphuric acid by contact process. **8**

   OR

4. a) Describe the manufacturing of triple super phosphate with engineering problems. **8**

   b) Explain production of Ammonia. **8**

5. a) Describe recovery of sucrose from sugarcane. **10**

   b) Explain production of dextrin in detail. **8**

   OR

6. a) Describe in detail the process for producing paper-pulp. **8**

   b) Explain production of ethyl alcohol by fermentation with engineering problems. **10**

P.T.O.

SECTION – II

7. a) Explain the hydrogenation process of oil. **8**

   b) Describe the construction and working of coke ovens. **8**

OR

8. a) Discuss the production of soap and natural glycerin. **8**

   b) Describe how penicillin is produced. **8**

9. a) Discuss the various refinery operations used in petroleum industry. **6**

   b) Explain production of water gas and producer gas. **10**

OR

10. Draw a neat flow diagram (**any two**) : **16**
    a) Catalytic reforming
    b) Isomerization
    c) Alkylation
    d) Pyrolysis.

11. a) Discuss production of Vinyl chloride using ethylene dichloride. **8**

    b) Explain the production of halogenated methane hydrocarbons. **10**

OR

12. a) Describe production of cumene. **8**

    b) Explain production of phenol by cumene oxidation with its engineering problems. **10**

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[3863] – 422

T.E. (Petrochemical) (Semester – I) Examination, 2010
APPLIED HYDROCARBON THERMODYNAMICS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator is **allowed**.*
*5) Assume suitable data, **if necessary**.*
*6) Refer to Steam Tables **if required**.*

SECTION – I

1. a) State 2nd Law of Thermodynamics and provide its mathematical expression explaining all the associated terms. **6**

   b) A heat exchanger is used to heat 147 kg/min of water from 23° C to 65° C. For this purpose, saturated steam at 100° C enters heat exchanger and leaves as saturated liquid at 100° C. Calculate entropy change of water, steam and universe in 1 minute. **8**

   c) An inventor claims to have designed a heat engine which absorbs 1234 kJ/s of energy from a source at 600° C and delivers 675 kW power. He further states that ambient atmosphere is at 27° C which is considered as sink for the heat engine. Is his claim valid ? Justify your answer. **4**

2. a) The critical temperature and pressure of ethane are 305.43 K and 48.84 bar. Calculate molar volume of the gas at 765 K and 5.6 MPa using :
      i) Ideal Gas Law
      ii) Van der Waals equation of state
      iii) Truncated form of virial equation.

      The virial coefficients are $B = -1.89 \times 10^{-4}$ m^3/mol and $C = -1.7 \times 10^{-8}$ $(m^3/mol)^2$. **8**

   b) Derive expression of law of corresponding states using Van der Waals equation of state. **4**

   c) Express various equations of states and their applications range. **4**

P.T.O.

3. a) Derive Maxwell's relations and explain their utility. **6**

   b) Discuss the major limitations of Ideal Gas Laws and the need of development of real gas equations. **4**

   c) Explain following :

   Compressibility factor, Acentric factor, Residual properties. **6**

4. a) Derive and discuss : **6**

      i) Clapeyron Equation

      ii) Clausius – Clapeyron Equation.

   b) Define following with proper thermodynamic basis : **4**

      i) Chemical Potential

      ii) Partial Molar Properties.

   c) It is desired to prepare 14.7 lit of 50 mol percent ethanol – water mixture. Determine volumes of ethanol and water need to be mixed in order to prepare the required solution. The partial molar volumes of ethanol and water are : 56.9×10^{-6} and 16×10^{-6} m^3/mol respectively.

   Additional data : molar volumes of pure components are $\nu_{ethanol} = 57.9 \times 10^{-6}\, m^3/mol$ and $\nu_{water} = 18 \times 10^{-6}\, m^3/mol$. **6**

5. a) Estimate approximate pressure at which a boiler is to be operated if it is desired to boil water at 187° C. Obtain relevant information from steam table. **4**

   b) Write short notes on (**any three**) : **12**

      i) Reversible and irreversible processes

      ii) P-V-T behaviour of pure fluids

      iii) Phase rule

      iv) Joule – Thomson expansion

      v) Role of thermodynamics in process design.

SECTION – II

6. For the system n-Pentane (1)-n-Heptane (2), Antoine's constants are given as follows : **18**

   Ln P = A – B/(T – C) where P is in kPa and T is in K.

Component	**A**	**B**	**C**
(1)	13.8183	2477.07	40.00
(2)	13.8587	2911.32	56.56

   Assuming ideal solution, calculate.

   a) The composition of vapor and liquid in equilibrium at 95 kPa and 335 K.
   b) The total pressure and composition of the vapor in equilibrium with a liquid containing 40 mol% pentane at 340 K.
   c) For the flash chamber working at conditions given in a), vapor and liquid flow rates leaving the chamber if the feed contains 60 mol% pentane and if the feed flow rate is 1000 kmol/hr.

7. Ethyl alcohol and hexane form an azeotrope at 33.2 mol% ethanol composition and at 101.3 kPa and 331.9 K at 331.9 K, vapor pressures for ethanol and hexane are 132.62 kPa and 113.96 kPa respectively.

   Calculate :

   a) The van Laar constants
   b) The vapor composition for a solution containing 45 mol% hexane at 331.9 K
   c) The total pressure for the conditions in part b. **16**

8. Volume of a mixture of two organic liquids 1 and 2 is given by

   $V = 110.0 - 17x_1 - 2.5\ x_1^2$

   V is volume in m^3/mol at 1.0 bar and 300 K.

   a) Find the expressions for partial molar volumes.
   b) Find the volumes of pure 1 and 2 required to be mixed in order to obtain 1000 m^3 of a solution containing 40 mol% of 1. **16**

9. Calculate equilibrium constant and equilibrium conversion at 298 K for the gas phase reaction.

   $C_2H_4 + H_2O \rightarrow C_2H_5OH$

   Assume free energies of formation (10^{-3} J/mol) of ethylene, water and alcohol to be 68.46, – 228.57 and – 168.49 respectively. Also assume stoichiometric reaction mixture. **16**

10. Write short notes : **16**

    a) Effect of temperature and pressure on equilibrium conversion

    b) Forms of Gibbs Duhem Equation and its utility

    c) Activity coefficient models

    d) T-x-y behaviour of azeotropes.

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[3863] – 424

T.E. (Petrochemical Engineering) (Semester – I) Examination, 2010
PETROCHEMICAL PROCESSES – I (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Describe with flowsheet the process for conversion of ethyl benzene to styrene. **10**

   b) Explain DVS with significance. **4**

   c) Write a note on Biazzi nitrator. **4**

2. a) Describe with flowsheet the process for conversion of acetaldehyde to acetic acid. **10**

   b) Write a note on reagents used for alkylation. **4**

   c) Write mechanism for bromination of benzene. **2**

3. a) Describe with flowsheet the process for manufacture of dodecyl benzene from benzene. **10**

   b) Mention the types of oxidative reactions with examples. **6**

4. a) Describe the continuous process for conversion of chlorobenzene to aniline. **8**

   b) Describe the process for preparation of 1, 2-dichloroethane from ethylene and chlorine. **8**

P.T.O.

SECTION – II

5. a) Describe with flowsheet the low pressure Ziegler process for conversion of ethylene to polyethylene. **12**

   b) Write a note on working up procedures for sulfonation. **6**

6. a) Write a note on carbon nano tubes and applications of nano materials in petrochemical industry. **6**

   b) Differentiate between chemical process and bio-chemical process. **4**

   c) Differentiate between : **6**
      i) Amination by reduction and by ammonolysis
      ii) Friedel Craft alkylation and acylation
      iii) Sulfonation and sulfation.

7. a) Describe with flowsheet the continuous process for manufacturing ethyl acetate. **10**

   b) Describe aromatic chlorination with respect to ethyl benzene, phenol, benzaldehyde and benzoic acid. **6**

8. a) Describe the photochlorination process for conversion of cyclohexane to chlorocyclohexane. **6**

   b) Write a note on hydrogenation catalysts. **5**

   c) Write a note on Bechamp reduction. **5**

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T.E. (Information Technology) (Semester – I) Examination, 2010
SOFTWARE ENGINEERING (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and answer Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Define software engineering. List the characteristics of software. **6**
   b) State and explain the customer's myths. **4**
   c) Explain the incremental software process model in detail. **8**

   OR

2. a) Explain the software process framework activities in brief. **10**
   b) Explain the Unified Processing model in detail. **8**

3. a) Explain the requirement elicitation and requirement elaboration tasks in brief. **10**
   b) Draw and explain the traceability table for requirement management. **6**

   OR

4. a) Explain the scenario based elements of analysis model in detail. **8**
   b) Draw a level 0, level 1 and level 2 DFD for a library book issuing system for a college student. **(1+2+5=8)**

5. a) In the context of software design explain the following in brief : **(4×2=8)**
      i) Modularity
      ii) Functional independence.
   b) Explain the layered architecture style in detail. **8**

   OR

P.T.O.

6. a) In the context of software design explain the following in brief : **(4×2=8)**
   i) Information hiding
   ii) Refactoring.
   b) What are the steps involved in user interface design ? How is the interface evaluation done ? **8**

SECTION – II

7. a) What are the objectives of unit testing ? How is unit testing carried out ? **6**
   b) What is basis path testing ? What is cyclomatic complexity ? How is it determined for a flow graph ? Illustrate with an example. **10**

OR

8. a) What is bottom up integration testing ? How is that carried out ? **8**
   b) What is unit testing and integration testing in object oriented context ? **8**

9. a) What questions need to be answered in order to develop a project plan using W^5HH principles ? **8**
   b) What is objective of software measurement ? What are the software estimation techniques based on problem decomposition ? Explain any one in brief. **8**

OR

10. a) What is OO metric ? **8**
    b) Explain the COCOMOII estimation model. **8**

11. a) What is a risk ? What are the types of software risks ? Write two examples of each. **6**
    b) What is RMMM ? Write a note on it. **10**

OR

12. a) What is project scheduling ? What are the basic principles of project scheduling ? **8**
    b) Define SCM. What are the contents of SCM repository ? **8**

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T.E. (Printing) (Semester – I) Examination, 2010
MANAGEMENT INFORMATION SYSTEMS AND COST ESTIMATION
(2008 Course)

Time : 3 Hours Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, ***if necessary****.*

SECTION – 1

1. A) Define the term objective. And also explain the term MBO. **8**

   B) List down the functions of management. And explain any two. **8**

OR

1. A) What are the elements of Competitive Environment ? Explain any two with suitable examples. **8**

   B) Differentiate between sole proprietorship and partnership type of business organization. **8**

2. A) What is MIS ? Explain the role of MIS in printing industry with suitable examples. **8**

   B) With suitable examples, explain the role of information in the competitive environment. **8**

OR

2. A) Explain ‘Information as a strategic resource’. **8**

   B) Discuss CIP3 and CIP4 in brief. **8**

P.T.O.

3. A) Explain three components of Decision Support System. **9**

   B) Explain various factors in DSS's success and failure. **9**

OR

3. A) Explain the components of Group Decision Support System. **9**

   B) Explain the factors in GDSS success. **9**

SECTION – 2

4. A) Explain various issues of information security and control. **8**

   B) Explain three components of DBMS. **8**

OR

4. A) Explain Data Warehousing related to printing application. **8**

   B) Explain Data Mining and its role in various management functions. **8**

5. A) Explain various elements of cost with suitable example. **8**

   B) Prepare the cost sheet with reference to the following data : **8**

   ABC Pvt. Ltd. is a stationery manufacturing company produces two types of stationery products, A – School stationery, B – Office stationery.

Direct material	:	A – 27,300	B – 97,850
Direct labour	:	A – 15,600	B – 61,800
Direct expenses	:	A – 6,420	B – 26,780

   Factory overheads are charged at 75% on labour cost. Administration overheads are charged at 25% on factory cost. Selling and distribution overheads are A – Rs. 25/unit and for B – Rs. 55/unit. Profit 10% for both the products and number of products sold are A – 78 and B – 206.

OR

5. A) Comment on the following, 'Cost is Fact, Profit is Opinion, Price is Policy'. **8**

   B) Explain the term standard cost and the standard format to find out the composite machine hour rate. **8**

6. A) Differentiate between Costing and Estimation. **9**

   B) How many boards of 25" × 30" size will be required for making cases for 5000 books in Demy octavo size ? **9**

OR

6. A) Explain in detail what all things to be known by an estimator before doing the estimation job with suitable examples. **9**

   B) Estimate the cloth roll of 98 cms wide and 25 meter in length will be required for making 2500 books in A4 size and with 20 mm spine. **9**

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T.E. (Civil) (Semester – I) Examination, 2010
STRUCTURAL ANALYSIS – II (2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
4) Use of electronic pocket calculator is allowed.
*5) Assume suitable data, **if necessary**.*
*6) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section – **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section – **II**.*

SECTION – I

1. a) Analyse the continuous beam loaded and supported as shown in figure 1(a) by slope-deflection method. The relative moment of Inertia values of all spans are indicated on the beam. Draw bending moment diagram. **8**

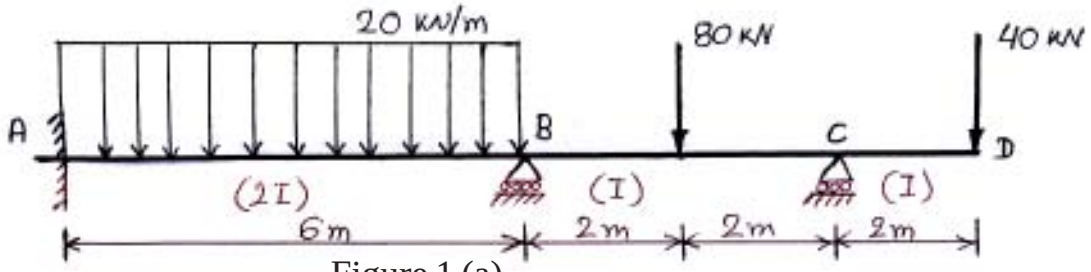

Figure 1 (a)

b) Analyse the frame as shown in figure 1(b). The relative values of I for each member are indicated in figure. E is constant use slope-deflection method. **8**

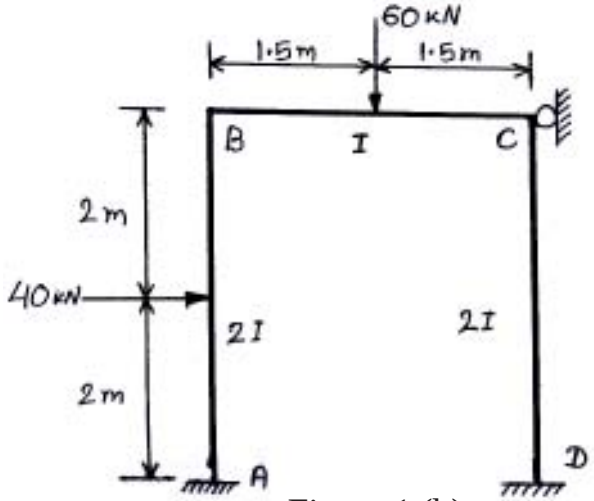

Figure 1 (b)

OR

P.T.O.

2. Using slope-deflection method determine end moments of the members of a frame loaded and supported as shown in figure 2. EI is same throughout. Plot bending moment diagram. **16**

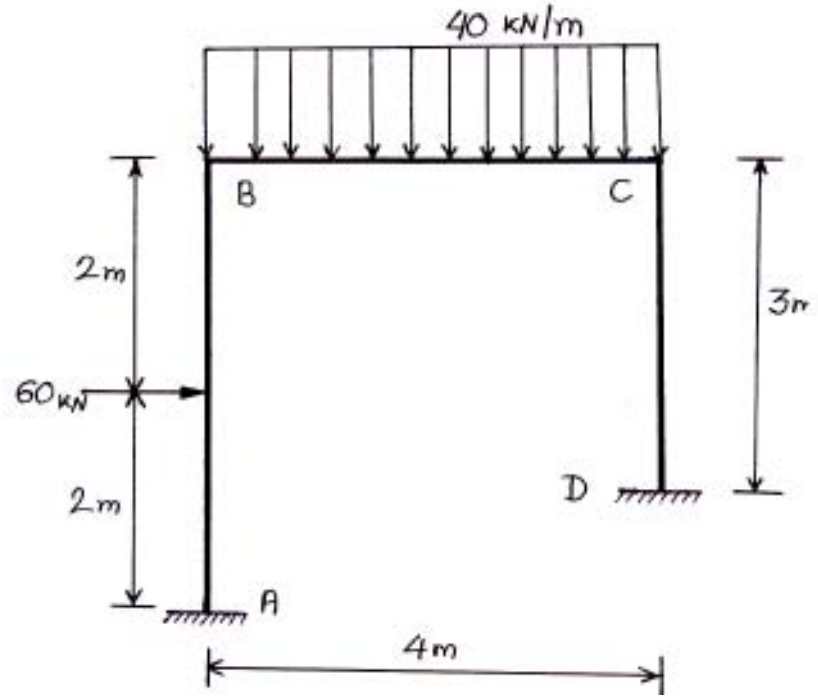

Figure 2

3. a) The continuous beam is as shown in figure 3 (a). The support B sink by 10 mm. Determine the support moment using moment distribution method. Also plot bending moment diagram. $E = 200\times10^{6}KN/m^{2}$ and $I = 100\times10^{-6}\ m^{4}$ $(100\times10^{6}\ mm^{4})$. **9**

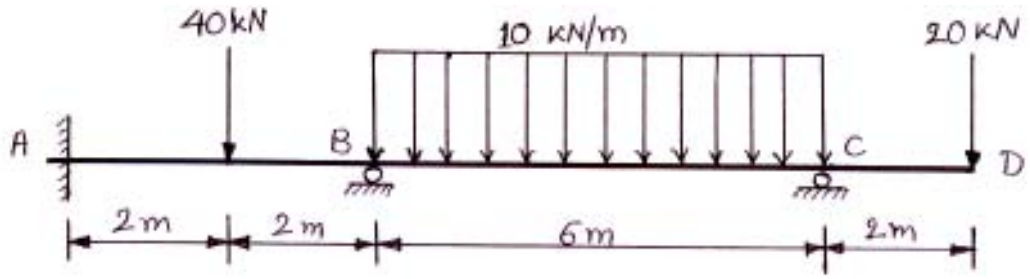

Figure 3 (a)

b) Analyse the rigid frame as shown in figure 3 (b) by Moment Distribution Method. E is constant and I is as shown in figure. **9**

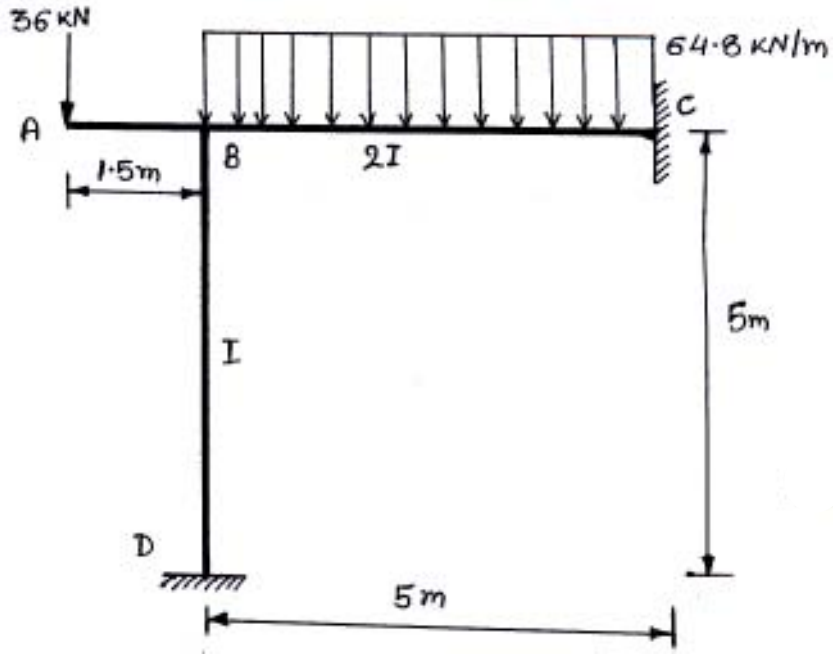

Figure 3 (b)

OR

4. Determine end moments of members of frame as shown in figure (4). E is constant and relative I values are indicated on frame. Plot deflected shape and bending moment diagram. **18**

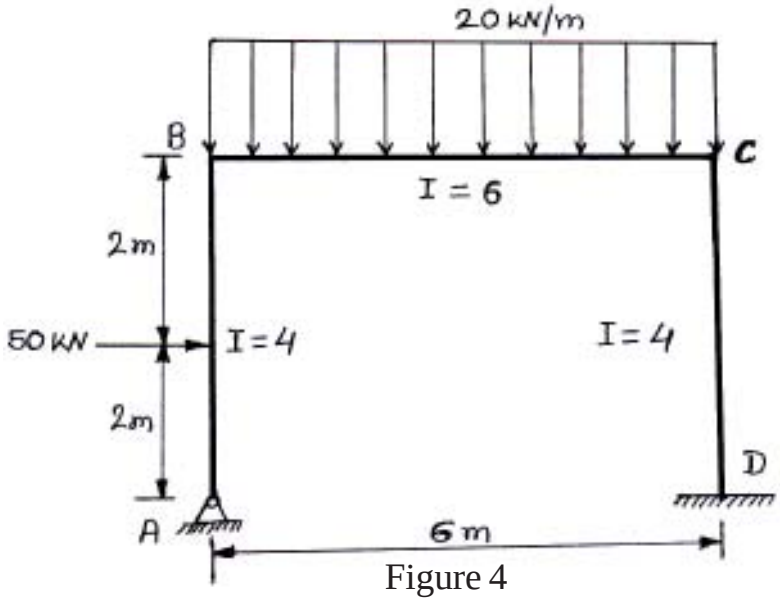

Figure 4

5. a) A three hinge circular arch hinged at springing and crown point has a span of 40 m and a central rise of 8 m . It carries uniformly distributed load of 20 KN/m over the left half of the span with a concentrated load of 100 KN at right quarter span point. Find the reactions at supports, normal thrust and shear at a section 10 m from the left support. **8**

   b) A two hinged parabolic orch of span 'L' and rise 'h' carries a concentrated load 'W' at the crown. Determine the expression for horizontal thrust developed at springings. **8**

OR

6. a) A three hinged parabolic arch having supports at different levels as shown in figure 6(a). Determine horizontal thrust developed. Also find bending moment, normal thrust and radial shear force developed at section 15 m from left support. **8**

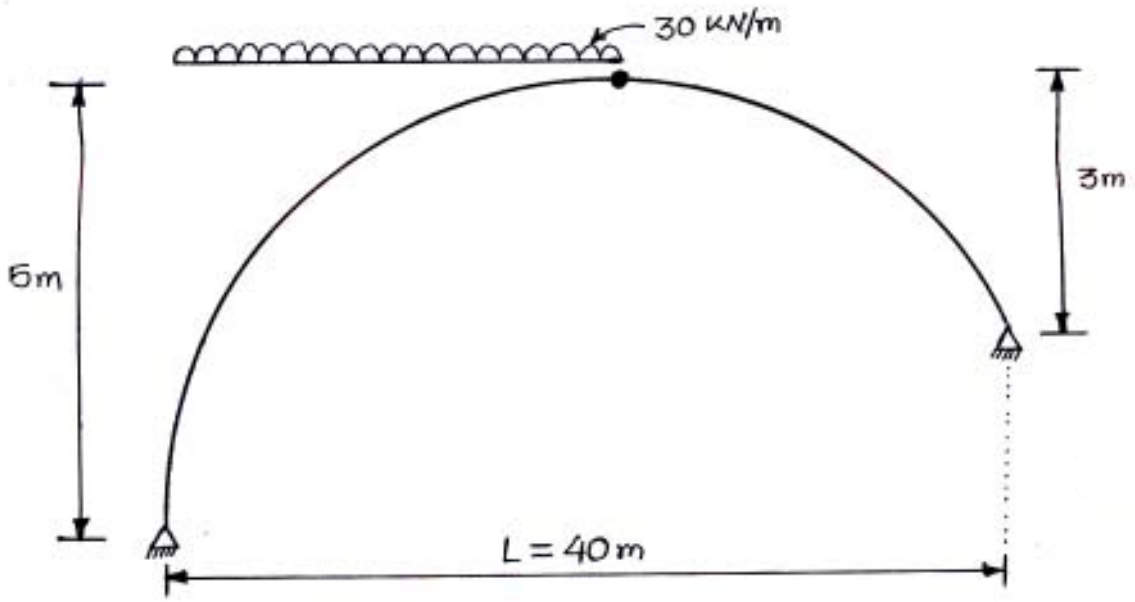

Figure 6 (a)

   b) Two hinged parabolic arch of span 30 m and rise 6 m carries two point loads, each of 60 kN, acting at 7.5 m and 15 m from left end respectively. Determine the horizontal thrust and bending moments below the point loads. **8**

SECTION – II

7. Analyse the truss supported and loaded as shown in fig. Q.7. Assume that the Elastic modulus and area of cross-section for all members are the same. **16**

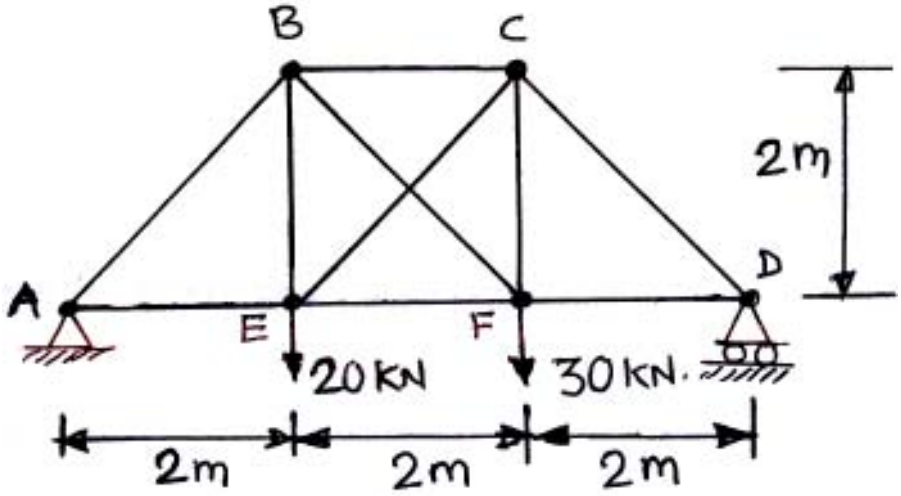

Fig. for Q.7

OR

8. Analyse the rigid jointed plane frame supported and loaded as shown in fig. Q.8, by flexibility method. Draw B.M.D. and elastic curve. **16**

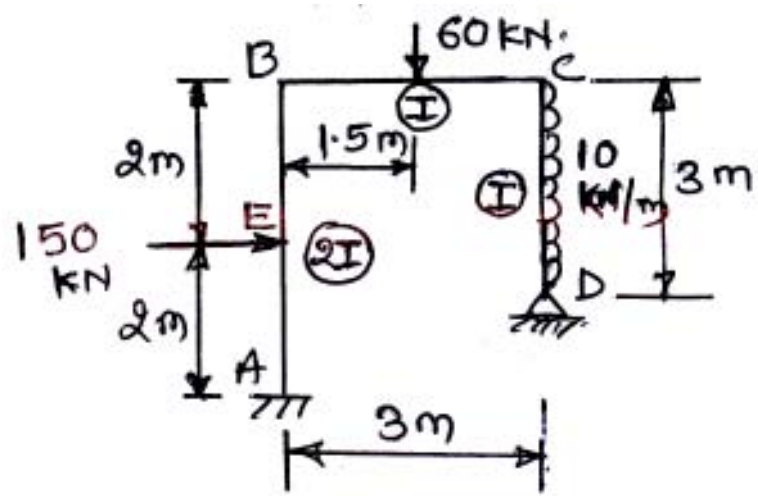

Fig. for Q.8

9. Analyse the beam as shown in fig. Q.9 by stiffness method. Draw B.M.D. and elastic curve. Take EI = constant. **16**

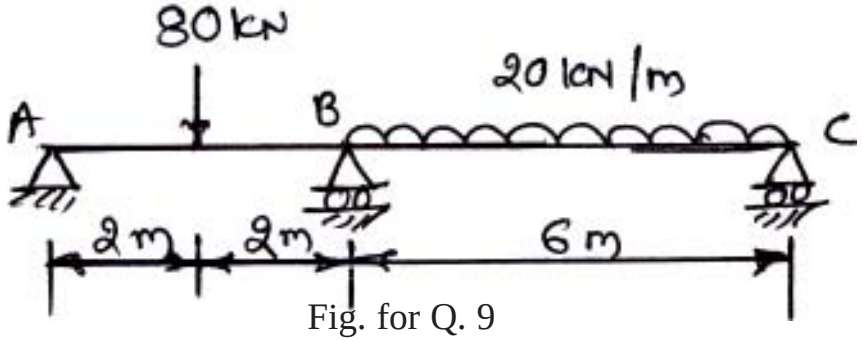

Fig. for Q. 9

OR

10. Analyse the rigid jointed plane frame supported and loaded as shown in fig. Q. 10 by stiffness method. Draw B.M.D. and elastic curve. Take EI = constant. **16**

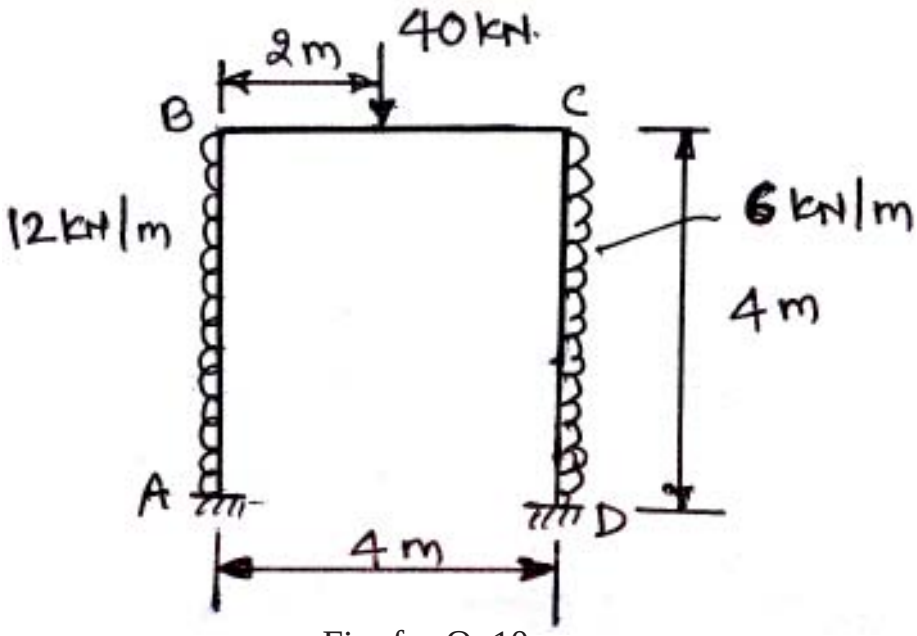

Fig. for Q. 10

11. a) The beam is supported and loaded as shown in fig. Q. 11 (a). Determine the deflection in terms of its EI under the load. Use finite difference method. Use five nodes. **6**

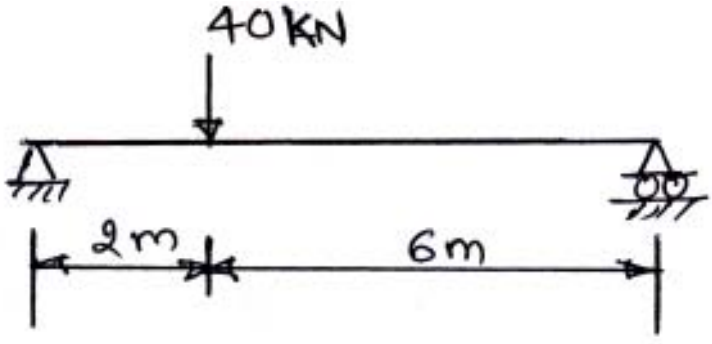

Fig. for Q. 11 (a)

b) Determine the approximate values of moment, shear, and axial force in each member of frame loaded and supported as shown in fig. Q. 11 (b). Draw B.M.D. Use portal method. **12**

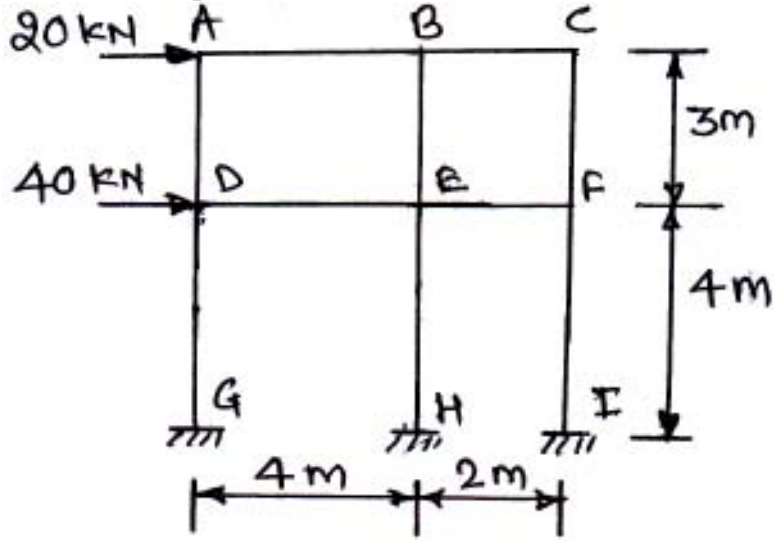

Fig. for Q. 11 (b)

OR

12. a) A beam supported at both ends having span 8 m. The beam carries uniformly distributed load of 10 KN/m over its entire span. Determine the central deflection in terms of its EI. Use finite difference method. Use five nodes. **6**

b) Determine the approximate values of Bending moment, shear force and axial force in the plane frame loaded as shown in Fig. Q. 12 (b) using cantilever method . Assume same area for all columns and draw B.M.D. **12**

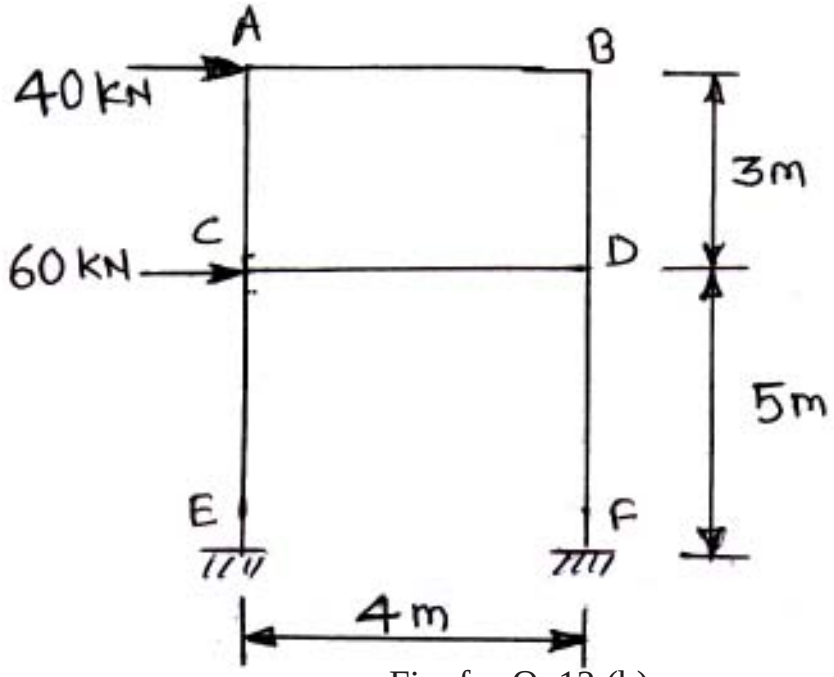

Fig. for Q. 12 (b)

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T.E. (Civil) (Semester – I) Examination, 2010
INFRASTRUCTURE ENGINEERING AND CONSTRUCTION TECHNIQUES (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Solve Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6** from Section – **I** and Q. **7** or **8**, Q. **9** or **10**, and Q. **11** or **12** from Section – **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) **Black** figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) Assume **suitable** data, if necessary.*

SECTION – I

1. a) State the various zones of Indian Railway. Explain in brief the organisational set up of Indian railways. **4**

   b) Draw a neat sketch of a permanent way. Also state the requirements of a good track. **6**

   c) Explain in brief the importance of coning of wheel. Also draw a neat sketch. **6**

OR

2. a) Define formation. State and explain various reasons of failure of formation. **6**

   b) Define Ballast. How minimum depth of ballast cushion is designed ? **6**

   c) Explain in brief the advantages and disadvantages of concrete sleepers. **4**

P.T.O.

3. a) Define following terms : **6**

   1) Turnout 2) Tongue rail

   3) Stock rail 4) Switch

   5) Crossing 6) Points.

   b) Define equilibrium cant. What is the equilibrium cant on a 2 degree curve on a broad gauge if 15 trains, 10 trains, 5 trains and 2 trains are running at a speed of 50 kmph, 60 kmph, 70 kmph and 80 kmph respectively ? **10**

OR

4. a) What do you understand by negative superelevation ? A 5° curve diverges from a 3° main curve in reverse direction in the layout of B.G. yard. If the speed on the branch line is restricted to 35 kmph. Determine the restricted speed on main line. **8**

   b) Write a short note on : **8**

   1) Directed Track Maintenance (DTM)

   2) Modernization in Indian Railways.

5. a) Compare the advantages and disadvantages of tunnels with open cut. **6**

   b) State various methods of Tunnel ventilation and explain any one detail. **4**

   c) What are the various points to be considered for selection of a site for Harbour ? **4**

   d) Define Dock. Differentiate between Wet Dock and Dry Dock. **4**

OR

6. a) State the general sequence of operation for driving tunnels through hard rock. **4**

   b) What do you understand by Mucking ? State various methods of mucking and explain any one in detail. **6**

   c) Define breakwater. What is the necessity of breakwater ? **4**

   d) Write a short note on TBM. **4**

SECTION – II

7. a) Highlight the importance of construction sector in any countrys' economic development, with the help of example and statistical figures. **6**

   b) Explain in brief the following : **8**

      i) Precast concrete.

      ii) Autoclave curing.

   c) Draw a neat labelled sketch of a static tower crane. **3**

OR

8. a) Explain, the need of mechanisation in the construction industry, clearly stating merits and demerits. **6**

   b) Differentiate between : **6**

      i) Precast and prefabricated elements.

      ii) Labour and equipment oriented works.

   c) "Planning a construction of any high rise structure is a very challenging job". Justify by the statement by giving suitable example. **5**

9. a) Explain in brief with suitable example, how 'scraper' is a versatile construction equipment. **4**

   b) Write a short note on following : **8**

      i) Power shovels.

      ii) Trenching Machinery.

   c) What is depreciation ? Explain any one method of depreciation. **4**

OR

10. a) Explain in brief Group behaviour of earth moving equipment. **6**

    b) What do you understand by "Earthwork Cycle" ? Also illustrate the importance of loader-dumper cycle time in equipment costing. **4**

    c) Write short notes on : **6**

    i) Preventive maintenance of equipments.

    ii) Record keeping of equipments.

11. a) Explain in brief the 'Termie Pipe' method of underwater concreting. Also state the advantages of this method over other methods. **6**

    b) Differentiate between Guniting and Shotcreting. Also write one application of each. **4**

    c) Write a short note on : **6**

    i) Drilling Equipments.

    ii) Grouting.

OR

12. a) Draw a schematic layout of RMC plant. Also state the advantages of RMC plant. **6**

    b) Explain in brief the Vacuume Dewatering System. **6**

    c) What is slipform shuttering ? State the distinct advantages of this method over the conventional m **4**

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T.E. (Civil) (Semester – I) Examination, 2010
STRUCTURAL DESIGN – I
(2008 Course) (New)

Time : 4 Hours Max. Marks : 100

Instructions : *1) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4** from Section **I** and Q. **5** or Q. **6**, Q. **7** or Q. **8** from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

*3) **Neat** diagram must be drawn **wherever** necessary.*

*4) Figure to the **right** indicates **full** marks.*

*5) Assume suitable data, if **necessary** and **clearly** state.*

*6) **Use** of cell phone is **prohibited** in the examination hall.*

*7) **Use** of electronic pocket calculator IS : 800-2007 and steel table is **allowed**.*

SECTION – I

1. a) Explain in brief design philosophy of limit state design for strength and serviceability. **10**

   b) Design a tension member using double unequal angle sections back to back on opposite faces of 10 mm thick gusset plate if it carries an axial factored load of 425 kN using 20 mm black bolt. Assume Fe-415 grade of steel. Draw the design sketch. **15**

OR

2. a) Differentiate between bolted and welded connection. **7**

   b) Explain the classification of cross section and hence find class of ISMB 300@44.2 kg/m. **8**

   c) A single angle ISA 90×60×6@6.8 kg/m is connected to 8 mm thick gusset plate at the ends with 4 nos. of 16 mm bolts to transfer tension. Determine the design tensile strength of angle section if the gusset plate is connected to the longer leg. **10**

P.T.O.

3. a) Determine the load carrying capacity of a compound column consisting of ISMB 400@72.4 kg/m with one cover plate of 300 mm×20 mm on each flange and having a length of 5 m. One end of the column is fixed and other end is pinned. Assume f_y = 250 Mpa. **10**

   b) Design a built-up column 10 m long to carry a factored load of 1100 kN. The column is restrained in position but not in direction at both ends. Design the column by using two channels back to back and single lacing with bolted connection. Draw the design sketches. **15**

OR

4. a) Design a single angle strut connected to the gusset plate to carry an axial compression of 200 kN. The length of the strut between centre to centre intersections is 3 m. Design welded connection of the joint. **10**

   b) Design a gusseted base for a built-up column ISHB 350@ 67.4 kg/m with two plates 450 mm×22 mm carrying an axial factored load of 3000 kN. The column is to be supported on concrete pedestal of M 20 grade. Draw the design sketches. **15**

SECTION – II

5. a) A simply supported beam of effective span 4 m carries a factored point load of 350 kN at mid span. The section is laterally supported throughout the span. Design the cross section using I-section. **10**

   b) Design a column of building frame with an effective length 3.2 m subjected to a factored axial load 500 kN and factored bending moment 45 kNm. Check for section strength only. **15**

OR

6. a) Design a suitable I-section for a simply supported beam of span 5 m carrying a dead load of 20 kN/m and imposed load of 40 kN/m. The beam is laterally unsupported throughout the span. Take f_y = 250 Mpa. **15**

   b) Design a moment resistance base for a ISHB 250 @ 54.7 kg/m column to carry a factored load of 600 kN and factored bending moment 50 kNm. **10**

7. A plate girder is subjected to a maximum factored moment of 4000 kNm and a factor shear force of 600 kN. Find the preliminary sections for the following conditions and cross section.

   a) Girder without any stiffener,

   b) Girder with end stiffeners only,

   c) Girder with end as well as intermediate transverse stiffeners. **25**

OR

8. A truss as shown in Fig. 8 is used for an industrial building situated in Pune. The truss is covered with G I sheet. Calculate panel point dead load, live load and wind load. Design the members L_0L_1, L_0U_1 and U_1L_1 and draw the design details. Assume $k_1 = 1$, $k_2 = 0.98$, $k_3 = 1$, $(c_{pe} - c_{pi}) = -0.8$. **25**

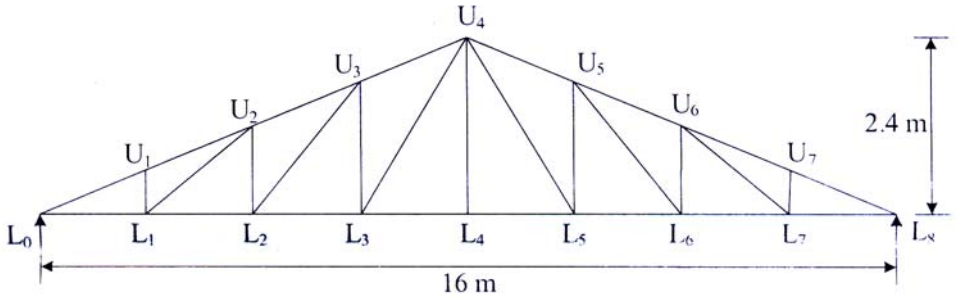

Fig. 8

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T.E. (Civil) (Semester – I) Examination, 2010
FLUID MECHANICS – II (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *i) Answer **Q.1** or **Q.2, Q.3** or **Q.4**, **Q.5** or **Q.6** in Section **I**.*
*ii) Answer **Q.7** or **Q.8, Q.9** or **Q.10, Q.11** or **Q.12** in Section **II**.*
*iii) Answer to the **two** Sections should be written in **separate** answer booklet.*
*iv) **Neat** diagrams must be drawn **wherever** necessary.*
*v) Black figure to the **right** indicate **full** marks.*
*vi) Your answer will be valued as a **whole**.*
*vii) **Use** of electronic pocket calculator is **allowed**.*
*viii) Assume suitable data, **if necessary**.*

SECTION – I

1. a) A rectangular tank 6 m long by 1.5 m wide is divided into two parts by a partition so that one part is 4 times the other part. The water level in the large portion is 3 m above that in the smaller. Find the time required for the difference of water levels in the two portions to be reduced to 1.2 m, if the water flows through an orifice at the bottom of the partition having an area of 58 cm^2 and $c_d = 0.6$. **8**

   b) Explain Karman Vortex Trail. **4**

   c) State various types of drags and discuss effect of free surface on drag. **6**

OR

2. a) Experiments were conducted in a wind tunnel with a speed of 54 km/h on a flat plate of size 2.4 m long and 1.25 m wide. The density of air is 1.20 kg/m^3. The plate is kept at an angle and the coefficient of lift and drag are 1.2 and 0.25 respectively. Determine (i) the lift force (ii) drag force (iii) resultant force (iv) direction of resultant and (v) power expended in overcoming resistance of the plate. **10**

   b) Explain one complete cycle of the water hammer phenomenon giving details of each stage. **8**

P.T.O.

3. a) A jet of water with a velocity of 30 m/s impinges on a moving vane of velocity 12 m/s at 30 to the direction of motion. The vane anagle at the outlet is 18. Find **8**
   i) The blade angle at inlet so that the water enters without shock.
   ii) The work done on the vane per unit weight of water per second entering the vane
   iii) The efficiency.

   b) Explain the following terms related to a centrifugal pump **8**
   i) Minimum starting speed ii) Hydraulic losses
   iii) Cavitation iv) N.P.S.H.

OR

4. a) Obtain the expression for the force acting, work done and efficiency in case of a single moving curve vane when the jet of water strikes and leaves the vane tangentially. **8**

   b) In a centrifugal pump it is usual to make the external diameter D_1 of the impeller to be twice the internal diameter (D). For this condition, show that the minimum diameter of an impeller which will enable it to pump water to a head H meters at a speed of N rpm at a manometric efficiency of 0.70 is **8**

$$D_1 = \frac{81.7\sqrt{H}}{N} \text{meter}$$

5. a) A Pelton wheel 2.5 m diameter operates under the following conditions **8**

Net available head (H)	= 300 m
Speed (N)	= 300 rpm
Coefficient of velocity of the jet (C_v)	= 0.98
Friction coefficient for vanes (K)	= 0.95
Blade angle (φ)	= 15°
Diameter of the jet (d)	= 20 cm
Mechanical efficiency (η_m)	= 0.95

   Determine (i) the power developed (ii) hydraulic efficiency (iii) specific speed.

   b) Draw a neat sketch of a typical Hydro-electric power plant indicating all the major components and state functions of each of the components. **8**

OR

6. a) Derive expressions for unit speed and unit discharge of turbines. **8**

   b) A Francis turbine of diameter 3.0 m develops 6750 kW at 300 rpm under a net head of 45 m. A geometrically similar model of scale ratio 1 : 8 is to be tested at a head of 9 m. Estimate the speed, discharge and power developed by the model. What is the specific speed for the model ? Assume overall efficiency of 0.82 for both the prototype and model. **8**

SECTION – II

7. a) Derive the continuity equation for open channel flow. **6**

   b) Differentiate between pipe flow and open channel flow. **4**

   c) Determine the dimensions of the most economical open channel of trapezoidal section to give an area 25 m^2. The side slopes of the channel are 1 : 2. Find the discharge if the bed slope is 1 : 2000 and Chezy's C = 45. **8**

OR

8. a) Explain factors affecting Manning's roughness coefficient. **6**

   b) Derive the Chezy's formula for uniform flow in an open channel. List the factors that affect the Chezy's coefficient. **6**

   c) Write a short note on 'Velocity distribution in open channel flow'. **6**

9. a) A rectangular channel is 3 m wide and carries a flow of 1.85 m^3/s at a depth of 0.5 m. A contraction of the channel width is required at a certain section. Find the greatest allowable contraction in the width for the upstream flow to be possible as specified. **8**

   b) Starting from first principle, derive an expression for the loss of energy due to jump in the form **8**

$$\Delta E = \frac{(y_2 - y_1)^3}{4 y_1 y_2}$$

OR

10. a) For a hydraulic jump in a rectangular channel, the loss of energy in the jump is 3.75 m and the pre-jump Froude number is 7.5. Determine- **8**
    i) The rate of flow
    ii) The conjugate depths
    iii) Relative loss

    b) State the characteristics of critical flow. **3**

    c) Explain channel transition with hump for sub-critical flow. Also draw sketches to show variation of depths over hump for the above transition. **5**

11. a) A wide rectangular channel carries a discharge of 3 $m^3/s/m$. The bed slope of the channel is 1:2500 and Manning's n = 0.08. At a certain section along this channel deph of flow is 2.25 m. How far upstream or downstream of this section the depth of flow will be within 10% of the normal depth ? Use direct step method. Use two steps only. **10**

    b) State practical examples of S_1, S_2, S_3 profiles. Draw figures for each. **6**

OR

12. a) State the assumptions made in the analysis of GVF. **3**

    b) Classify the channel bed slopes and show various zones. **5**

    c) What do you understand by GVF ? Show that for GVF in a channel, the water surface slope, with usual notations may be written as **8**

$$\frac{dy}{dx} = \frac{S_0 - S_f}{1 - F_r^2}$$

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T.E. (Civil) (Semester – I) Examination, 2010
ADVANCED SURVEYING (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Define Geodetic Surveying. What factors are to be considered while selecting a best triangulation figure or system ? **6**

   b) What is GPS ? State and explain various components of GPS. **5**

   c) What are the various points to be considered for selection of a Triangulation station ? **5**

OR

2. a) What are the various potential error sources that affect the GPS signal or result ? **5**

   b) Differentiate between Absolute positioning and Relative positioning. **5**

   c) There are two stations A and B at elevations of 200 m and 1000 m respectively. The distance between A and B is 100 km. If the elevation of a peak P at a distance of 40 km from A is 300 m. Show that station A and B are intervisible. **6**

3. a) Find the most probable values of the angles A, B and C of a triangle ABC from the following observations (Use method of differences). **8**

   $A = 65° 15' 30''$ weight = 3

   $B = 51° 11' 25''$ weight = 2

   $C = 63° 32' 34''$ weight = 4

   b) Explain stepwise procedure of computation of sides of a Spherical Triangle by Spherical Trigonometry. **6**

   c) Define following terms. **4**

   1) Conditioned equation
   2) Weight of an observation
   3) Most probable value
   4) Mistake.

OR

4. a) Explain step by step procedure of figure adjustment of a Geodetic quadrilateral without central station. **6**

   b) What is spherical excess ? How it is calculated ? **4**

   c) The following are the observed values of an angle : **8**

Angle	**Weight**
40° 20′ 20″	2
40° 20′ 18″	2
40° 20′ 19″	3

   Find i) Probable error of single observation
   ii) Probable error of weighted arithmetic mean
   iii) Probable error of single observation of weight 3.

5. a) The following reciprocal observations were made at two points P and Q. **10**

   Angle of depression of Q at P = 7′ 35″

   Angle of depression of P at Q = 9′ 05″

   Height of signal at P = 4.82 m
   Height of signal at Q = 3.95 m
   Height of instrument at P = 1.15 m
   Height of instrument at Q = 1.28 m
   Distance between P & Q = 36320 m

   Calculate i) The R.L. of Q if that of P is 395.46 m
   ii) Average coefficient of refraction at the time of observation.
   Take R sin 1″ = 30.88 m.

   b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground. **6**

OR

6. a) The following observations were taken in a trigonometric levelling survey. **10**

   Angle of depression to P at Q = 1° 45′ 32″

   Height of instrument at Q = 1.18 m
   Height of signal at P = 4.22 m
   Horizontal distance between P & Q = 6945 m
   Coefficient of refraction = 0.07
   If the R.L. of Q is 345.32 m, calculate R.L. of P.

   b) Describe in brief the location survey of a long bridge. **6**

SECTION – II

7. a) Explain with reference to aerial photograph, what is meant by end overlap and side overlap and why they are required ? **6**

   b) A pair of photograph is taken with a camera having focal length 15 cm. The scale of photography is 1 : 10000 and photobase is 5.65 cm. The measured parallax of a vertical control point having an elevation 140 m is 87.28 mm. Compute the elevation of another point P whose measured parallax is 84.18 mm. **6**

   c) What is digital photogrammetry ? Draw neat schematic diagram of digital photogrammetric environment and discuss in brief various elements of digital photogrammetry. **6**

OR

8. a) What is parallax of a point in photogrammetry ? Describe the procedure of measuring parallax using parallax bar. **6**

   b) Two points P and Q have elevation 280 m and 650 m above the datum respectively. The coordinates of P and Q measured from the photograph taken with camera having focal length of 15 cm are tabulated below. **6**

Point	**Co-ordinate**	
	X	**Y**
P	+ 35.4 mm	+ 17.5 mm
Q	– 25.8 mm	+ 39.6 mm

   Calculate length of PQ. Flying height is 3000 m above datum.

   c) What is DEM ? How to acquire data required to develop a DEM ? State use of DEM. **6**

9. a) Discuss in brief various kinds of resolution in respect of remotely sensed images. **5**

   b) Explain with sketches the term atmospheric window and spectral signature. **6**

   c) What makes data spatial ? State difference between vector and raster data. Draw sketches to support your answer. **5**

OR

10. a) List down few GIS softwares and discuss in brief features of any one of such software. **6**

    b) Define datum. State difference between local and global datum and bring out concept of datum transformation. **5**

    c) Discuss in brief applications of remote sensing in mapping. **5**

11. a) Define Hydrographic surveying and enlist various objectives of hydrographic surveying. **5**

    b) The $\angle ASB$ 30° 25′ and $\angle BSC$ = 45° 25′ are measured with a nautical sextant at a sounding station O with respect to three control stations A, B, and C on bank. Stations B and O being on opposite sides of line AC. AB = 4 km, BC = 4.995 m and AC = 8.169 km. Work out distances of the sounding station O from station A, B and C. **6**

    c) Describe in brief the process to carry out hydrographic survey to plot cross section of a river about 400 m wide and with not more than 10 m depth of standing water at the proposed bridge site. **5**

OR

12. a) What is mean by sounding ? Enumerate different instruments required for sounding proper and explain echo sounding. **5**

    b) What is tidal gauge ? List down different types of tidal gauges. Explain any one type of tidal gauge. **5**

    c) When it is required to reduce the planimetric position of a sounding station by solving a three point problem. Enlist the method to solve a three point problem. Explain any one mechanical method. **6**

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T.E. (Mechanical) (Semester – I) Examination, 2010
(2008 Course)
MACHINE DESIGN – I (New)

Time : 4 Hours Max. Marks : 100

Instructions *:1) Answer* ***any three*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of electronic pocket calculator is* ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – I

Unit – I

1. The layout of a shaft is as shown in fig. 1. Pulley D (diameter 480 mm) drives the shaft, while pulley C (diameter 150 mm) transmits power to a compressor. The belt tensions for pulley C are 1500 N and 600 N. The ratio of belt tensions for pulley D is 3.5. Find the shaft diameter as per A.S.M.E. code. Yield strength and ultimate tensile strength for shaft material are 380 MPa and 720 MPa respectively. Assume K_b = 1.75 and K_t = 1.25.

   If the solid shaft is replaced by a hollow shaft with outside diameter 30 mm, find inside diameter of the shaft. Compare the weights of the solid and hollow shaft. **16**

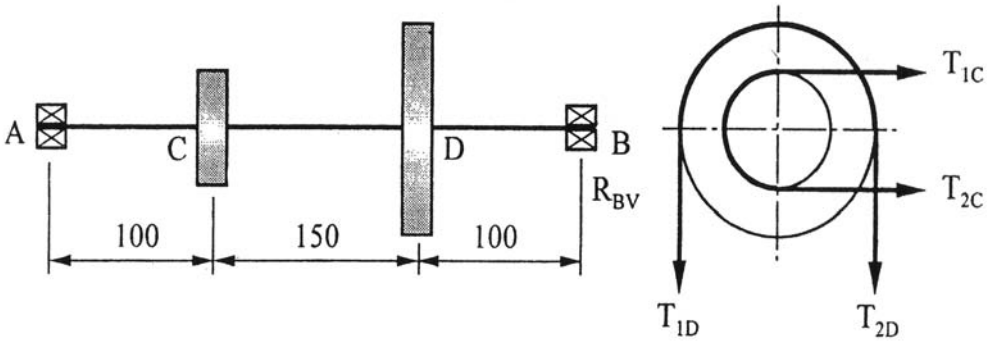


Figure 1 [Q.1]

OR

2. a) An automobile gearbox uses a splined shaft to transmit power of 10 kW at 1500 rpm. The spline used is designated as 6×28×34. The bearing pressure is limited to 5 MPa. Calculate the length of splines in hub, based on bearing pressure criterion. Also determine force required to shift the gear, if coefficient of friction is 0.05. **4**

   b) Design a C.I. flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm. The allowable shear stress for shaft material is 40 MPa. The allowable shear stress and crushing stress for key and bolt material are 45 MPa and 85 MPa respectively. The permissible shear stress for C.I. is 14 MPa. The key is having square cross-section with (width)=(thickness)=[(diameter of shaft)|4].

   The number of bolts are 6. The bolts are fitted in reamed and ground holes and are fingure tight. **12**

Unit – II

3. a) Derive formula for torque required to raise the load and torque required to lower the load by a square threaded power screw. **6**

   b) In a machine tool application, the tool holder is pulled by means of an operating nut mounted on a screw. The tool holder travels at a speed of 5 m/min. The screw has single start square threads of 48 mm nominal diameter and 8 mm pitch. The operating nut exerts a force of 500 N to drive the tool holder. The mean radius of friction collar is 40 mm. The coefficient of friction for thread and collar surfaces is 0.15. Calculate

      i) Power required to drive the screw.

      ii) Efficiency of the mechanism. **10**

OR

4. A 26×5 square threaded single start power screw is used to support a load of 12 kN. The effective diameter of collar is 46 mm and coefficient of friction is 0.15. The nut is made of phosphor bronze having 0.12 as coefficient of friction and 6 MPa as allowable bearing pressure. The length of handle is 300 mm. Calculate,

   i) Force required to raise the load.

   ii) Force required to lower the load.

   iii) Yield strength of material for factor of safety of 4.

   iv) Overall efficiency.

   v) Number of threads in nut. **16**

Unit – III

5. a) Write a note on 'Bolts of uniform strength'. **4**

   b) An eccentrically loaded bolted joint as shown in (fig. 2), is to be designed. All bolts are to be of same size. Determine the size of bolts, if permissible shear stress for bolt is 50 MPa. **14**

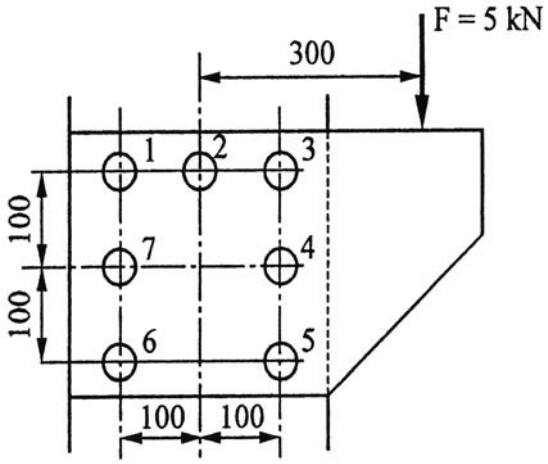


Figure 2 [Q.5. b.]

OR

6. A bracket supporting an eccentric load is welded by three fillet welds as shown in fig. 3. Determine size of weld, if permissible shear stress is limited to 66 MPa.

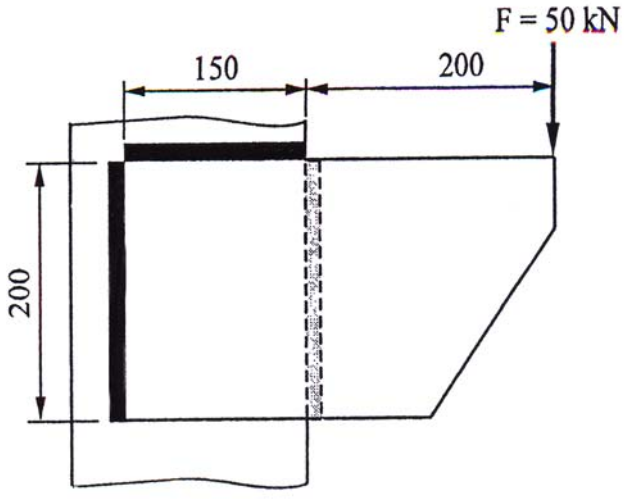


Figure 3 [Q 6]

What additional load would the bracket support if same size welding is done on all four sides ? **18**

SECTION – II

Unit – IV

7. a) Discuss the role of a flywheel. **3**

   b) Discuss the following terms **4**

      i) Coefficient of fluctuation of speed

      ii) Coefficient of fluctuation of energy.

   c) Torque developed by an engine is given by $11250 + 8550 \sin 3\theta$ Nm and load torque is expressed as $11250 + 5550 \sin\theta$ Nm where θ is the crank angle.

      For a rimmed flywheel calculate thickness of rim and stresses developed inside the rim (when effect of arms is neglected) also find power produced by the engine use following data

      Engine speed 720 rpm

      Limiting peripheral speed of the flywheel is 28.2 m/s

      Spokes and hub contribute 8% of total flywheel effect

      Rim width to thickness ratio is 1.8

      Density of Rim material is 7280 kg/m^3

      Speed fluctuation is limited to 2.5% either side of mean speed. **11**

OR

8. Design a Rimmed Flywheel using following data

   Flywheel has 6 Elliptical arms

   Flywheel is used for a punching press

   Punching press executes 20 holes of 26 mm diameter in a plate of 17 mm thickness per minute

   For the plate material, permissible shear strength is 365 MPa

   Actual punching lasts for 1/4 angular rotation of crank shaft

   Flywheel shaft is joined with crankshaft of press using a reduction gear of ratio 8 : 1

Mechanical efficiency of punching machine is 81%

During punching flywheel speed drops by 9% of mean speed

Flywheel rim radius is 0.45 m

Density of rim material is 7649.33 kg/m^3

Permissible tensile stress for rim is 8.5 MPa

For the rim ratio of width to thickness is 3.8

Rim contributes 83% of the total flywheel effect

Assume ratio of maximum torque to average torque as 2. Assume arm effect up to the shaft and neglect hub effect while designing arms. **18**

Unit – V

9. a) Draw a neat sketch of a multi-leaf spring and show its essential parts. **4**

   b) Design a helical compression spring for a pressure relief valve using following data

   Operating pressure 14.5 bar

   Valve lift 7 mm at 18% pressure rise

   Diameter of valve 37 mm

   Limiting mean coil diameter 36 mm

   Permissible value of shear stress for spring material 465 MPa

   Modulus of rigidity 83 GPa

   Standard spring wire diameters are ..., 6, 6.5, 7, 7.5, 8, 8.5,...

   Clash clearance is 15% of maximum deflection of spring

   End style for the spring is squared and ground

   Find pitch of the spring p using equation for free length L_F as $L_F = pn + 2d$.

   Where n is number of active turns and d is spring wire diameter. **12**

OR

10. a) A composite spring is subjected to a load of 12.67 kN. Inner spring is 13 mm shorter than the outer spring. Find stress developed inside both the springs using following data. **10**

	Outer spring	**Inner Spring**
Outside diameter of coil of spring (mm)	180	90
Number of active turns	8	14
Wire diameter (mm)	20	10
Modulus of Rigidity (MPa)	81550	80335

b) For a helical torsion spring find stresses and angular deflection using following data

Diameter of coil	105 mm
Diameter of wire	15 mm
Modulus of elasticity	2.1×10^5 N/mm^2
Number of active turns	6
Load	40.36 kN-mm.

6

Unit – VI

11. a) Derive a relation for optimum velocity of a belt for maximum power in terms of initial tension and mass per unit length of the belt. **5**

b) A V-belt is used to connect an electric motor having capacity 20 kW and running at 1440 rpm to an agitator. The pitch diameters of motor pulley and agitator pulley are 300 mm and 900 mm respectively.

The coefficient of friction for both the pulleys is 0.2

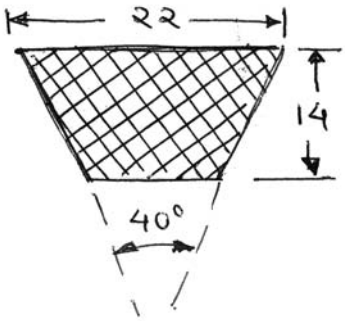
The central distance between the pulleys is 1 m.

The mass density of the belt material is 0.97 gm/cc

Maximum allowable tension in the belt is 850 N

Find how many belts are required for this application.

Assume dimensions of the cross-section of belt as shown in following figure. 4 **11**



All the dimensions are in mm

Fig. 4 **[Q. 11 (b)]**

OR

12. a) Discuss stresses developed in wire ropes. **4**

b) A Flat belt is used to transmit 15 kW power from a pulley running at 1440 rpm to another pulley running at 480 rpm. The central distance between the pulleys is twice the diameter of larger pulley.

The belt velocity is approximately 20.35 m/s.

The maximum allowable stress in the belt is 2.25 MPa

The density of belt material is 0.95 gm/cc

Coefficient of friction is 0.35

The thickness of belt is 5 mm

Calculate :

i) Diameter of both the pulleys

ii) Length and width of the belt

iii) Belt tensions **12**

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T.E. (Mechanical) (Sem. – I) Examination, 2010
INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *i)* ***All*** *questions are* ***compulsory****.*
ii) Options are given within a question.
iii) Use ***separate*** *sheets for two Sections.*
iv) Assume ***suitable*** *data if necessary.*
v) Draw ***neat*** *and labelled diagrams* ***wherever*** *necessary.*

SECTION – I

1. a) Explain the concept of scientific management. Also discuss the Frederick Taylor's contribution towards scientific management. **8**

   b) Explain the following functions of management with the help of suitable examples. **6**

      i) Directing ii) Controlling.

   c) Explain the need of Motivation. **4**

OR

   a) Explain the selection criteria for material handling system. **6**

   b) Explain 'Maslow's Hierarchy' of needs. **6**

   c) Explain in detail any three principles of good plant layout. **6**

2. a) Define Productivity. How it is measured ? **6**

   b) Discuss the importance of Motion economy. **6**

   c) State the limitations of time study. **4**

OR

a) Explain the various criteria considered for selecting a process for method study. **6**

b) Explain two Handed chart with suitable example. **6**

c) Explain the difference between job evaluation and merit rating. **4**

3. a) Explain in brief the various functions of production planning and control. **8**

b) What is the importance of standard costing ? Explain the method to calculate standard cost of a product. **8**

OR

a) Explain the concept of Break Even Analysis. **6**

b) State the various forecasting methods. Explain any one in detail. **6**

c) Explain the significance of Economic Order Quantity (EOQ). **4**

SECTION – II

4. a) Explain the importance of Technology management in present scenario. **8**

b) Discuss the various important steps in product development. **6**

c) Write a short note on Forms of Technology. **4**

OR

a) Discuss the growth of technology in concern with Indian industries. **8**

b) Explain the relationship between technology development and competition. **6**

c) Discuss the impact of technology on society. **4**

5. a) What do you mean by Technological Forecasting ? Explain. **6**

b) Explain the scope of innovation management. **6**

c) What is Technology Assessment ? **4**

OR

a) Explain the various techniques used in technological forecasting. **6**

b) Explain in brief the following :

i) Technological Leadership

ii) Mission flow diagram. **6**

c) Discuss the Morphological Analysis. **4**

6. a) Explain the various key principles for developing technology strategy. **6**

b) Explain the concept of Technology Diffusion. **6**

c) Write a short note on Technology Transfer Process. **4**

OR

a) Discuss the process of Technology Forecasting. Also state its applications. **6**

b) Explain the term 'Technology Absorption'. **6**

c) Write a short note on speed of Diffusion. **4**

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[3863] – 315

T.E. (Mechanical) (Semester – I) Examination, 2010
COMPUTER ORIENTED NUMERICAL METHODS (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) Black figures to the **right** indicate **full** marks.*
*3) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) Apply Newton Raphson method to determine the roots of the equation $f(x) = \cos x - xe^x = 0$ to an accuracy of 0.0001. **8**

   b) Draw a flow chart for Gauss Quadrature 2 point formula. **6**

   c) Represent Successive approximation method graphically. **2**

OR

2. a) Draw a flowchart for Modified Newton Raphson method to determine the root of equation correct up to three decimal places. **6**

   b) Evaluate the double integration of $f(x,y) = x^2+y^2+5$ for x = 0 to 1 and y = 0 to 2 taking step size in x as 0.25 and y as 0.5 using Simpson's $1/3^{rd}$ rule. **10**

Unit – II

3. a) Values of X in degrees and Sin X are given in following table. Using that data estimate value of Sin 38. **8**

X	15	20	25	30	35	40
Sin X	0.258819	0.3420201	0.4226183	0.5	0.573576	0.642787

   b) Distance travelled by a car is as shown in the table. Estimate the Distance traveled, Velocity and acceleration of car when t = 4.5 hrs. **10**

t in hrs	1	2	3	4	5
X in Km	14	30	62	116	198

OR

4. a) Find Cubic spline curve for the following data and hence determine y(5). **10**

X	3	4.5	7
Y	2.5	1.0	2.5

b) Following table gives angular displacement θ (in Radian) at different intervals of time t(in second). Calculate angular velocity at instant t = 0.06. **8**

θ	0.052	0.105	0.168	0.242	0.327	0.408	0.489
t	0	0.02	0.04	0.06	0.08	0.10	0.12

Unit – III

5. a) Solve using Gauss Seidal method with relaxation parameter of 0.99 correct up to an accuracy of 0.001. **10**

$7x + 20y + 3z = 111$

$23x - 11y + 7z = 161.5$

$10x + 13y + 22z = 190.5$

b) Draw a flow chart for Thomas Algorithm for Tri-diagonal Matrix. **6**

OR

6. a) Solve the following system of equation using Gauss elimination with partial pivoting.

$4x + y + z = 4$

$x + 4y - 2z = 4$

$3x + 2y - 4z = 6$ **8**

b) Draw a flowchart for Gauss Seidal method with partial pivoting. **8**

SECTION – II

Unit – IV

7. a) Kinematic viscosity of water (v) is related to temperature (T) in the following manner :

T(°C)	0	4	8	12	16	20	24
v, 10^{-2} cm^2/sec	1.7923	1.5676	1.3874	1.2396	1.1168	1.0105	0.9186

Use method of least squares to fit the parabolic equation of the form $v = a+bT+cT^2$ for the data. Use the Gauss Elimination method to solve the silultaneous equations for a, b &c. **10**

b) Derive the expressions for absolute and relative error in
i) Addition ii) Multiplication iii) Division. **6**

OR

8. a) A material is tested for cyclic fatigue failure whereby a stress in MPa, is applied to the material and the number of cycles needed to cause failure is measured. The results are in the table below :

N, Cycles	1	10	100	1000	10000	100000	1000000
Stress, MPa	1131	1058	993	801	651	562	427

When a log-log plot of stress versus cycles is generated, the data trend shows a linear relationship (straight line). Use the method of least squares to find the equation of that straight line. **7**

b) Draw a flowchart for straight line curve fit. **5**

c) Round off the number 665250 to four significant figures and compute absolute, relative and percentage error. **4**

Unit – V

9. a) The rate of cooling of a metal ball can be expressed as

$$\frac{dT}{dt} = -k(T - Ta)$$

k = Constant of proportionality = 0.2 min^{-1},

T = Temperature of metal ball (°C),

Ta = Temperature of surrounding medium (°C),

If a metal ball heated to 90°C is dropped into water that is held to Ta=20°C, find :

i) temperature of ball after 1 min by using Modified Euler method correct to two decimal place accuracy,

ii) temperature of ball after 2 min by using Runge Kutta of 2^{nd} order method,

iii) temperature of ball after 3 min by using Runge Kutta of 4^{th} order method,

iv) temperature of ball after 4 min by using Milne Simpson's method correct to four decimal places. **12**

b) Draw a flowchart for Euler's method. **4**

OR

10. a) Solve the second order differential equation $\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + y = 0$

Given that at x = 0, y = 0.5 and $\frac{dy}{dx} = 0.1$, find :

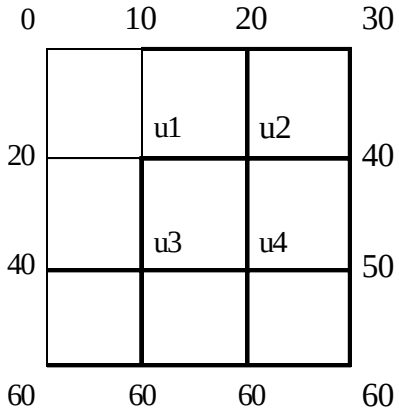
i) y at x = 0.1 by using Runge Kutta of 2nd order method,

ii) y at x = 0.2 by using Taylor Series method. Take series upto 3rd derivative (y'''). Take h = Δx = 0.1. **10**

b) Draw a flowchart for Modified Euler Method. **6**

Unit – VI

11. a) Solve the Laplace equation $\nabla^2 u = 0$ for the given boundary conditions shown in fig. 11a. **10**



b) Draw a flowchart for Parabolic equation solved by Bender Schmidt method. **8**

OR

12. a) Solve $25u_{xx} = u_{tt}$, given $u_t(x, 0) = 0$, u(0, t) = 0, u(5,t) = 0 and

u(x, 0) = (25 – 5x) $1 \le x \le 2$

u(x, 0) = 5(5 –x) $2 \le x \le 4$

Solve the equation numerically for $0 \le t \le 0.3$ taking $\Delta x = 1$, $\Delta t = 0.1$. **10**

b) Draw a flowchart for Poisson's equation $\nabla^2 u = f(x, y)$. **8**

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[3863] – 321

T.E. (Mechanical S/W) (Semester – I) Examination, 2010
PRODUCTION MANAGEMENT
Elective – I (New) (2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answer ***3*** *questions from Section* ***I*** *and* ***3*** *questions from Section* ***II****.*
3) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
5) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) What are four duties of management advocated by Taylor ? How that duties developed in next expansion ? **8**

   b) What are the basic principles of good organization ? Give typical organization structure of a company manufacturing single product. **8**

   OR

   a) Differentiate between private company and public company, cooperative society and joint stock company. **8**

   b) How business is classified ? What are objective of business ? **8**

2. a) What are objectives of production management ? List components of production function. **8**

   b) What are different types of production ? Explain distinguishing features of any one. **8**

   OR

   a) What is industrial engineering ? Define its functions and applications. **8**

   b) What is meant by plant layout ? What are classical types of plant layout ? What are its advantages and disadvantages ? **8**

P.T.O.

3. a) What different types of charts are made in method study ? Discuss them briefly. **10**

   b) Following are the elemental items of a broaching operation. The corresponding ratings and relaxation allowances are given. **8**

Element	Observed Time	Rating
1) Locate part on pilot end of the broach, engage broach into pulling head	0.15	80
2) Start Machine	0.05	80
3) Broach	0.50	100
4) Aside part into a trolley	0.04	110
5) Brush off broach clean	0.10	120
6) Return unit (broach and pulling head) back to start position	0.05	100
7) Disengage broach from pulling head	0.10	80

Calculate standard time for this operation assuming relaxation allowance of 13% and contingency allowance of 3%.

OR

a) Explain time study procedure. **10**

b) Explain MTM1, MTM2, WFS and MOST. **8**

SECTION – II

4. a) Explain one type of control chart. State objectives of different charts. **8**

   b) What is producers and Consumers risk ? Explain AQL and AOQL. **8**

OR

a) Define OC curve and explain its significance. **8**

b) What is acceptance sampling ? What are characteristics of acceptance sampling. **8**

5. a) What is six sigma ? What are benefits of six sigma to the company ? **8**

b) Define TPM. Explain eight pillars of TPM. **8**

OR

a) What is Concurrent Engineering ? Explain in brief. **8**

b) List TQC Tools. Explain poka yoke. **8**

6. a) What is ISO 9001 : 2000 ? List five main sections under it. Explain any three sections in brief. **10**

b) What is FMEA and FTA ? **8**

OR

a) Explain concept design of experiment. **10**

b) Explain in brief Reliability and Taguchi Method. **8**

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[3863] – 322

T.E. (Mechanical Sandwich) (2008 Course) (Semester – I)
Examination, 2010
(B) BEHAVIOURAL SCIENCE (New)
Elective – I (Self Study)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answer ***3*** *questions from Section –* ***I*** *and* ***3*** *questions from Section –* ***II****.*
3) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
5) Assume ***suitable*** *data, if* ***necessary****.*

SECTION – I

1. Discuss the advantage, disadvantage, limitation of Public Limited, Private, Co-operative and Small Scale Company. **16**

2. a) Explain with sketch project structure and Matrix structure. **8**

   b) Explain 2010 Urban and Rural Law. **8**

3. a) Define Motivation. Explain Herzberg's two factor theory of motivation. **8**

   b) Explain the main characteristics of industrial licensing. **8**

4. Write a short note on **(any three)** : **18**

   i) Line and staff organisation.

   ii) Maslow's theory.

   iii) Personality Traits.

   iv) Influence of people on Enterprise.

P.T.O.

SECTION – II

5. a) Explain organizational behavior with its importance. **8**

   b) What do you mean by informal organizations ? State benefit and problem associated with it. **8**

6. a) What are traits of effective leaders ? Explain in brief. **8**

   b) What are different communication barriers ? Explain in brief. **8**

7. a) Explain path – Goal Model of leadership. **8**

   b) What is active listening ? State guidelines for effective listening. **8**

8. Write short notes on **(any three)** : **18**

   1) Theory X and Theory Y.

   2) Leadership Roles.

   3) Leadership Behavior.

   4) Communication Symbols.

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[3863] – 331

T.E. (Production) (Semester – I) Examination, 2010
METROLOGY AND MECHANICAL MEASUREMENTS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1)* ***All*** *questions are* ***compulsory****.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Figures to ***right*** *indicate* ***full*** *marks.*
4) Assume ***suitable*** *data* ***wherever*** *necessary.*

SECTION – I

1. a) State the Abbe's principle of alignment and explain the term sine and cosine error with suitable example. **8**

   b) What are standards of measurements ? Explain the classification of various standards. **8**

OR

2. a) Differentiate between the following : **8**
   1) Systematic and random errors
   2) Accuracy and Precision.

   b) What is sine bar ? Explain in detail with neat sketch the application of sine bar. **8**

3. a) State and explain the Taylor principle of gauge design. **8**

   b) Design workshop type GO and NOGO gauge for inspection of $30f_8$ shaft. **10**

OR

4. a) Explain with neat sketch sigma comparator and state its application. **8**

   b) Design a plug gauge of checking the hole 70 H_8. **10**

5. a) Comment on surface roughness and machining processes. **3**

   b) Write short note on CMM. **3**

   c) Derive the relation for calculating the chord length and depth of gear by using constant chord method. **10**

   Calculate chord length and its distance below tooth tip for a gear module 4 mm and pressure angle 20°.

OR

6. a) Sketch and explain the optical arrangement of NPL gauge length interferometer. **8**

   b) Explain with neat sketch working principle of Talysurf. **8**

SECTION – II

7. a) Explain the importance of mechanical measurement system with the help of generalized block diagram and give the performance characteristics of measuring instruments. **8**

   b) What are sensors ? Explain with neat sketch the working of any one sensor. **8**

OR

8. a) Give the criterion for selection of transducer and describe the working of various parts of transducer with examples of Mechanical transducer and Variable resistance transducer. **8**

   b) Explain input output configuration of measuring system with suitable example. **8**

9. a) Justify the statement "Dead weight tester is the basic primary standard used worldwide for the accurate measurement of pressure". **10**

   Discuss the criteria for selection of a flow meter and explain differential pressure flow meter.

   b) Explain the laws, construction and working of thermocouple temperature measurement. **8**

OR

10. a) Explain with neat sketch the flow measurement by drag effects and calibration of flow measuring devices. **10**

    b) Describe the diaphragm pressure gauge and bellow pressure gauge with the help of neat sketches. **8**

11. a) Explain the characterization of the performance of a force measuring system and explain the working of torque testing dynamometer with neat sketch. **8**

    b) Explain strain measurement, strain operation, gauge factor and signal conditioning in strain measurement. **8**

OR

12. a) Discuss the use of particular types of strain gauges for specific strain measurement w.r.t their practical applications. **8**

    b) Discuss the basic methods of force measurements. **8**

    Write short note on maintenance replacement of measuring equipments.

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[3863] – 332

T.E. (Production) (Semester – I) Examination, 2010
KINEMATICS OF MANUFACTURING MACHINES (New)
(2008 Course)

Time : 4 Hours Max. Marks : 100

Instructions *:1) Answer* ***three*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Explain with neat sketch the kinematic analysis of fellows gear shaper. **10**

   b) Explain Blotch method of synthesis of a four bar mechanism to obtain the desired values of velocities and accelerations for input link, coupler link and output link. **8**

OR

2. a) In a four bar mechanism ABCD, the link AD is the fixed link and the dimensions of various links are : AB = 50 mm, BC = 100 mm, CD = 150 mm and AD = 180 mm. The angular velocity and angular acceleration of the link AB are 20 rad/s and 10 rad/s^2 respectively. For 45° inclination of input link AB, determine :

   i) Angular displacement of output link CD **3**

   ii) Angular velocity of output link CD **3**

   iii) Angular acceleration of output link CD **4**

   b) Explain E22, C13 and K23 structures with suitable examples and comment on their selection. **8**

P.T.O.

3. a) For a pair of involute spur gears module is 10 mm, pressure angle 20°, number of teeth of pinion are 20, gear ratio is 2 and speed of pinion is 60 rpm. The addendum of each gear is such that the path of approach and path of recess on each side is 50% of the maximum possible length. Determine :

   i) Addendum of the gear **3**

   ii) Addendum of the pinion **3**

   iii) Length of arc of contact **2**

   b) For a compound epicyclic gear train shown in Fig. 1, number of teeth of gears A, B and C are 65, 45 and 30 respectively. The speed of shaft connected to sun gear A is 120 rpm counterclockwise and gear D is fixed. Calculate :

   i) Number of teeth of gear D. **2**

   ii) Speed of shaft connected to arm E. **6**

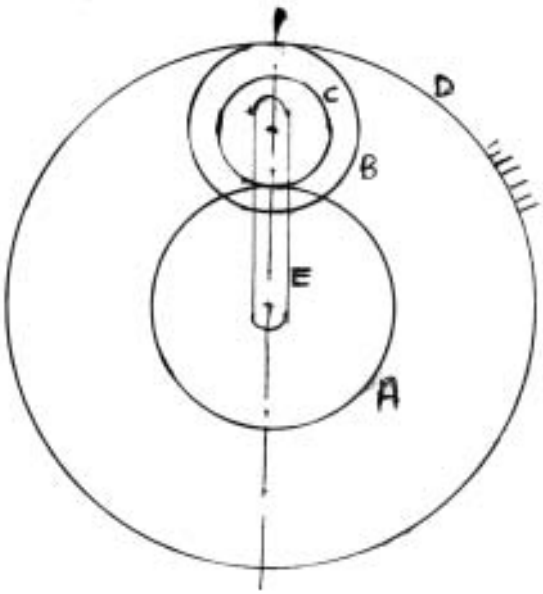

Figure 1

OR

4. a) For a gear having 20° full depth involute teeth, module 10 mm, and number of teeth 30, Calculate :

   i) Thickness of tooth at base circle. **3**

   ii) Thickness of tooth and at addendum circle. **5**

   b) Explain with suitable example the use of differential mechanism in machine tool applications. **8**

5. a) A punching press is required to punch 30 mm diameter hole in a plate of 10 mm thickness at the rate of 30 holes per minute. It requires 10 N-m of energy per mm^2 of sheared area. If the punching takes 1/10 of a second and speed of the flywheel varies from 160 to 140 rpm, determine the mass of the flywheel having radius of gyration of 1.2 meter. **10**

   b) Explain the following terms :

   i) Coefficient of fluctuation of speed **2**

   ii) Maximum fluctuation of energy **2**

   iii) Coefficient of fluctuation of energy **2**

OR

6. a) A machine shaft runs at a mean speed of 300 rpm. It requires a torque which varies uniformly from 1500 N-m to 4000 N-m during first half revolution. During next one revolution, the torque remains constant and then decreases uniformly to 1000 N-m during next one revolution and then remains constant for one revolution. The machine is coupled by a constant speed motor to which is connected a solid flywheel of radius 0.80 m. If the fluctuation of speed is $\pm$ 2% of the mean speed, find :

   i) Power of motor **4**

   ii) Maximum fluctuation of energy **4**

   iii) Mass of flywheel. **4**

   b) What is main function of a flywheel in an engine. **4**

SECTION – II

7. a) Explain with sketches different types of cams and the followers. **6**

   b) It is required to set out the profile of a cam with oscillating follower for the following motion :

   i) Follower to move outward to an angular displacement of 20° during 90° of cam rotation

   ii) Follower to dwell for 45° of cam rotation

   iii) Follower to returns to its initial position in 90° of cam rotation

   iv) Follower to dwell for the remaining period of the revolution of the cam. The distance between the pivot centre and the follower roller center is 70 mm and the roller diameter is 20 mm. The minimum radius of the cam is 50 mm. The location of pivot point is 70 mm to the right and 60 mm above the axis of rotation of the cam. The motion of the follower is to take place with equal uniform acceleration and retardation during outstroke and SHM during return stroke. **12**

OR

8. a) What is pressure angle in cam action ? How it is important in cam design ? List the methods of reducing the pressure angle. **6**

   b) Layout the profile of a cam so that the follower

   - Is moved outwards through 30 mm during 180° of cam rotation with cycloidal motion.
   - Dwells for 20° of the cam rotation
   - Returns with uniform velocity during the remaining 160° of the cam rotation. The base circle diameter of the cam is 50 mm and the roller diameter 15 mm the axis of the follower is offset by 10 mm to the left. What will be the maximum velocity and acceleration of the follower during the out stroke if the cam rotates at 300 rpm counter-clockwise. **12**

9. a) Four masses A,B,C and D are completely balance. Masses C and D make angles of 90° and 195° respectively with that of mass B in the counter-clockwise direction. The rotating masses B,C and D are 25 kg, 40 kg and 35 kg respectively. The masses A, B, C and D are at radii 150 mm, 200 mm, 100mm and 180mm respectively. The planes B and C are 250 mm apart. Determine :

   i) The mass A and its angular position with mass B

   ii) The position of all the planes relative to plane of mass A. **10**

   b) Write a note on ‘direct and reverse cranks method’. **6**

OR

10. a) Derive the expressions for an uncoupled two cylinder locomotive engine for

    i) Variation of tractive force

    ii) Swaying couple. **10**

    b) Prove that resultant unbalanced force is minimum when half of the reciprocating masses are balanced by rotating masses. **6**

11. a) What are causes and effects of vibration ? **6**

    b) Define the following terms : **6**

    i) Free vibration

    ii) Forced vibration

    iii) Damped vibration

    iv) Longitudinal vibration

    v) Transverse vibration

    vi) Damping ratio.

c) Find the equation of motion and the natural frequency of the system shown in Fig. 2. **6**

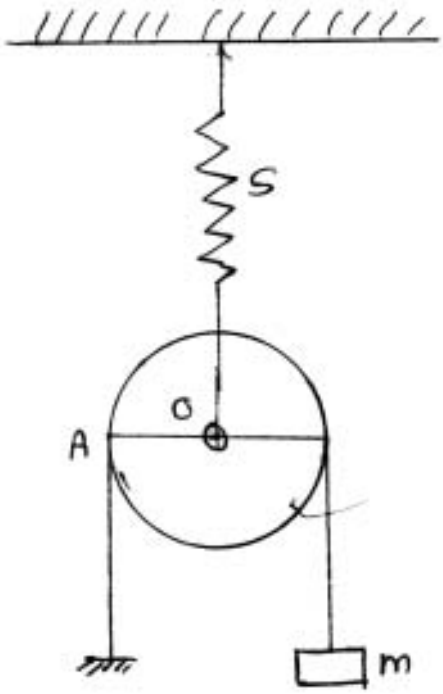

Fig. 2

OR

12. Write short notes on **(any three)** : **18**

a) Vibration transmissibility

b) Vibration isolation

c) Critical speed of shaft

d) Logarithmic decrement.

[3863] – 333

T.E. (Production and Industrial Engineering) (Semester – I)
Examination, 2010
MATERIAL FORMING (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

Unit – 1

1. a) Explain the concept of material forming. Classify the material forming operations on the basis of applied load. **8**

   b) Calculate the workdone in deforming a rod of aluminium to fracture. The diameter of the rod is 10 mm and length 250 mm. The Young's modulus is 670 N/mm^2, yield stress 75 MPa, work hardening index 0.25 and ultimate tensile stress 135 MPa. What percentage of total work done was used for elastic deformation ? **8**

OR

2. a) Explain and differentiate between hot forming and cold forming. Explain briefly the factors affecting the deformation. **8**

   b) What are the assumptions in material forming ? Explain any one yield criteria. **8**

Unit – 2

3. a) Explain and differentiate between open die forging and closed die (impression) forging. **8**

   b) Explain the following operations with neat sketch **8**

   i) fullering ii) edging
   iii) blocking iv) finishing

OR

4. a) Explain the factors to be considered while designing a forging die. **8**

   b) Explain 'Machine forging' (upsetting) with neat sketch. State the applications. **8**

Unit – 3

5. a) In wire drawing operation, show that the drawing stress is given by the equation. **12**

   $$\delta_d = \delta_0 \frac{(1+B)}{B}\left[1-(1-RA)^B\right]$$

   Where B = $\mu \cot\alpha$, μ = coeff of friction and α = semi-die angle

   RA = Reduction in area

   δ_σ = yield stress

   δ_d = drawing stress

   Assume backpull is zero.

   b) Explain 'wire drawing die' and show the various zones of wire die with neat sketch. **6**

OR

6. a) Determine the power required to draw a steel wire from 8 mm to 6 mm in diameter at 80 m/min. The coeff. of friction between die and wire is assumed to be 0.05. Die angle is 6°. The average flow stress of steel is assumed to be 300 MPa. Also calculate maximum reduction possible. **10**

   If the wire is subjected to backpull of 100 N/mm^2 determine drawing stress, power required and maximum reduction possible.

   b) Explain the preparation of the stock before wire drawing operation. **8**

SECTION – II

Unit – 4

7. a) Explain the problems in rolling and explain how to overcome these problems. **8**

   b) Explain the following with neat sketch : **8**

   i) Four high rolling mill ii) Planetary mill

OR

8. a) Explain various defects occurs during rolling operation. State the causes and suggest the remedies. **8**

   b) Explain the breakdown passes in rolling with its principal series. **8**

Unit – 5

9. a) Explain and differentiate between forward and backward extrusion with neat sketch. **8**

   b) Explain how the seamless tubes are manufactured with extrusion process. **8**

OR

10. a) Explain and differentiate between direct extrusion and indirect extrusion with neat sketch. **8**

    b) Explain the process required to form the following component. **8**
       i) Cans
       ii) Aluminium sliding windows of E-section.

Unit – 6

11. a) Explain confined and unconfined system of explosive forming. **9**

    b) Explain the important parameters of electro-hydraullic forming that affects the deformation. **9**

OR

12. Write short note on : **18**
    i) Stretch forming
    ii) HVF
    iii) Die material in explosive forming.

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T.E. (Production) (Semester – I) Examination, 2010
PRODUCTION MANAGEMENT (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer* ***any three*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – I

Unit – I

1. a) Discuss the scope and objectives of production management. **8**
   b) Explain the frame work for production management. **8**

OR

2. a) "Production Management is process of planning, organizing and controlling the activities of production function". Explain. **8**
   b) Give the organizational structure for production management. **8**

Unit – II

3. a) Define Production Planning and Control (PPC). State the objectives of PPC. **8**
   b) Explain with block diagram functions of PPC. **8**

OR

4. a) How do you differentiate production planning and production control ? **8**
   b) Explain following production system : **8**
      i) Make to stock
      ii) Make to order
      iii) Assemble to order.

P.T.O.

Unit – III

5. a) What are the factors that influence the selection of location for a plant ? **4**

   b) Define plant layout. What are the objectives of good plant layout ? **6**

   c) Consider a following assembly network relationship of a product. The number of shifts per day is one and the number of working hours per shift is 8. ABC company aims to produce 40 units of the product per shift.

Operation No.	Immediate Preceding Task	Duration (Min)
1	-	9
2	1	4
3	1	3
4	1	5
5	1	8
6	3, 7	5
7	2	6
8	4, 5	7
9	6	9
10	7, 8, 9	9

   i) Draw the precedence diagram. **2**

   ii) What is the desired cycle time ? **2**

   iii) What is the theoretical number of workstations ? **2**

   iv) What are the efficiency and balance delay of the solution obtained ? **2**

OR

6. a) Explain the different types of computerized plant layout. **6**

   b) What is the relationship between good plant layout and Material Handling (M.H) system ? **6**

   c) What are different types of material handling equipment ? **6**

SECTION – II

Unit – IV

7. a) Explain why an organization has to go for sales forecast ? Explain in brief any two sales forecasting methods. **9**

   b) There is a correlation between population of the city and the TATA NANO sold. This relation is shown in the following table :

Population in lakhs	4	7	9	12	16	19
No. of TATA NANO sold in thousands	2	3	4	5	6	7

   Estimate the sales of TATA NANO with population 22 and 26 lakhs. **9**

OR

8. a) Explain various demand patterns used in sales forecasting. **8**

   b) The following table gives the demand for 7 months.

Month	1	2	3	4	5	6	7
Demand	700	850	900	1050	950	1200	1440
Forecast	500						

   Forecasted demand for first month is 500. Calculate the demand for the remaining 6 months using single exponential smoothing with $\alpha = 0.3$. **6**

   Also calculate :

   i) MAD (Mean Absolute Deviation) **2**

   ii) MAPE (Mean Absolute Percentage Error) **2**

Unit – V

9. a) Define the following : **6**

   i) Forward and Backward Scheduling

   ii) Finite Loading

   iii) Critical Ratio Scheduling.

b) There are seven jobs, each of which has to go through the machines A and B in the order of AB. Processing times in hours are given as : **10**

Job	1	2	3	4	5	6	7
Machine A	4	13	16	7	11	12	10
Machine B	9	11	11	7	13	2	4

Determine a sequence of these jobs that will minimize the total elapsed time.

OR

10. a) Explain in brief priority-sequencing rules. **8**

b) A project consists of 8 activities. Precedence relation and activity times are given. Draw the network diagram and compute the critical path for the activities. **8**

Activity	**Immediate Predecessor**	**Activity Time (Weeks)**
P	-	12
Q	-	20
R	-	28
S	R	12
T	P, Q	28
U	T, S	12
V	S	8
W	U, V	8

Unit – VI

11. a) Write short note on : **16**
   i) Just – In – Time
   ii) Concept of World Class Manufacturing
   iii) Concept of Waste Management
   iv) Energy audit

OR

b) Write short note on : **16**
   i) Lean Manufacturing
   ii) Advanced Manufacturing Philosophies
   iii) Computerized Production Management
   iv) Energy Conservation

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T.E. (Production Sandwich) (Semester – I) Examination, 2010
MANUFACTURING TECHNOLOGY (Self Study)
(2008 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) **Assume** suitable data, if **necessary**.*
*6) **All** questions are **compulsory**.*

SECTION – I

1. Draw schematic diagram, explain in brief working principle, state advantages and limitations and applications, mention process parameters for any two of the following non-traditional machining processes :
   a) Abrasive Jet Machining.
   b) Electro chemical machining.
   c) Electron Beam Machining. **16**

OR

1. a) Draw schematic diagram, explain in brief working principle, state advantages, limitations, applications and process parameters for any one of the following non-traditional machining processes. **8**
      i) Electro dischange machining.
      ii) Ultrasonic machining.
   b) Write short notes on :
      i) Requirement that demand use of NTM processes. **4**
      ii) Laser Beam machining. **4**

2. a) Explain the importance of plastics as material for product. Which are different types of plastics ? Enlist characteristics of elastomers. **12**
   b) What is calendaring ? Explain its significance. **4**

OR

2. a) Write short notes on **any four** of the following plastic processes. **16**
   i) Thermoforming
   ii) Laminating and rein forcing
   iii) Recycling of plastics
   iv) Machining of plastics
   v) Blow moulding and applications.

3. a) Explain in brief need of Micro-Electro Mechanical Systems (MEMS) and its relevance along with applications of new age products. **10**

   b) What is nonotechnology ? Explain its advantages, limitations and applications in brief. **8**

OR

3. Write short notes on (**any three**) : **18**
   i) Lithography
   ii) Diffusion and implantation
   iii) Printed circuit boards
   iv) Bonding
   v) Crystal growing and wafer preparation.

SECTION – II

4. a) What is comparator ? Classify the different types of comparators. **4**

   b) What are the salient features of a comparator and how are they achieved in 'sigma comparator' ? Explain your answer with sketches. **12**

OR

4. a) Describe the use of optical flats and mono-chromatic light for dimensional comparision and testing flatness of surface. **8**

   b) A slip gauge of nominal length 10 mm was measured on a gauge length interferrometer using red, green and blue light of a cadmium lamp of which wavelengths are

   Red $\lambda_1 = 0.6438\ \mu m$

   Green $\lambda_2 = 0.5086\ \mu m$

   Blue $\lambda_3 = 0.4800\ \mu m$

   The observed fractional displacements were respectively 0.8, 0.9 and 0.5. Determine error in length of gauge. **8**

5. a) State the essential requirements for accuracy in construction of sine bar. Why is it that use of sine bar is not recommended for angles larger than 45° with reference plane ? **8**

   b) A 100 mm sine bar is to be set up to an angle 32.5°. Determine the slip gauges needed. **4**

   c) Explain with sketch working of spirit level. **4**

OR

5. Write short notes on following : **16**
   i) Angle gauges
   ii) Autocollimator
   iii) Angle dekkor
   iv) Surface finish measurement.

6. a) Explain objectives and functions of cost estimating. What are the principle factors in cost estimating ? **10**

   b) Explain with suitable example procedure for cost estimation. **6**

   c) What is the need for scrap estimation ? **2**

OR

6. Write short notes on : **18**
   i) Estimation of volume and weight of material.
   ii) Methods of depreciation.
   iii) Replacement techniques.

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T.E. (Electrical Engineering) (Semester – I) Examination, 2010
ENGINEERING ECONOMICS AND MANAGEMENT (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any one*** *question from* ***each*** *unit.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

Unit – I

1. State & explain various types of business ownership. **16**

OR

2. a) Define engineering economics. Explain the concept of supply, demand & elasticity of demand. **8**

   b) State and explain law of variable proportion. **8**

Unit – II

3. a) Differentiate between Administration & Management. **8**

   b) Explain the contribution of F.W. Taylor in the field of Management. **8**

OR

4. a) Define Inventory. Explain various types of inventory. **8**

   b) Explain in brief following : **8**

      i) Six Sigma

      ii) Kanban.

P.T.O.

Unit – III

5. a) What is Marketing ? Differentiate between marketing & selling. **9**

   b) Elaborate '4'Ps of marketing with suitable examples. **9**

OR

6. a) Define Financial Management. Explain various types of cost. **10**

   b) Explain the following terms **(Any two)** : **8**

      i) Debit
      ii) Credit
      iii) Budget
      iv) Depreciation.

SECTION – II

Unit – IV

7. a) Define Motivation. Explain Herzberg theory of motivation. **8**

   b) Explain 'X' & 'Y' theory of motivation. **8**

OR

8. a) Define the term 'Entrepreneurship'. Explain the role played by an entrepreneur in Indian economy. **8**

   b) Define Leadership. Explain the qualities of good leader. **8**

Unit – V

9. a) What is the need & objective of training in the organisation? Explain on the job & off the job training. **8**

   b) Explain Recruitement process in detail. **8**

OR

10. a) Write short notes : **16**

      i) Development of personality
      ii) Labour Welfare
      iii) Business Ethics
      iv) Time Management.

Unit – VI

11. a) Define the term Disaster Management. State the importance & scope of Disaster Management. **9**

    b) Explain various Natural & Manmade disaster. **9**

OR

12. a) Explain the phases of preparedness & mitigation of disasters. **9**

    b) Write short notes : **9**

    i) Use of GPS & GIS for disasters management

    ii) Total preventive maintenance.

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T.E. (Electrical Engineering) (Semester – I) Examination, 2010
(2008 Course)
MICRO CONTROLLER AND ITS APPLICATIONS [New]

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II.***
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*6) Assume suitable data, if **necessary.***

SECTION – I

1. a) With a neat diagram explain the internal RAM organization of 8051. **8**
   b) Describe the various flags in 8051. **6**
   c) Explain the functions following pins **4**

      i) T0 (P3.4) ii) $\overline{\text{PSEN}}$.

      OR

2. a) Explain the use of following registers **8**

      i) DPTR ii) Register B iii) Program Counter iv) Accumulator

   b) Compare microcontrollers and microprocessors. **6**
   c) Why ports P0 and P2 are unavailable for I/O operation when external memory is interfaced? **4**
3. a) Explain the various addressing modes of 8051 and give one example of each addressing mode. **6**
   b) Write a program to square the contents of R5, Place the result in R0 & R1. Store the Most significant byte of the result in R1. **6**
   c) Write a program to complement the contents of accumulator if P1.5=1. **4**

      OR

4. a) Write a program to copy an array of 16 elements from a location 30H onwards to 50H onwards. **6**

   b) Explain the stack organization of 8051 and the instructions associated with the stack. **6**

   c) Write an assembly language program for 8051 to select register bank 3. **4**

5. a) Explain in detail the interrupt structure in 8051. **6**

   b) Explain the Serial Peripheral Interface (SPI) protocol. **4**

   c) Write a program to transfer a letter 'T' Serially 10 times at a baud rate of 4800. Use serial port in Mode 1. **6**

OR

6. a) Write a program to generate a square waveform of frequency 2KHz on pin P2.2. Assume the crystal frequency of 11.0592 MHz. **6**

   b) Write a short note on 12C Bus. **4**

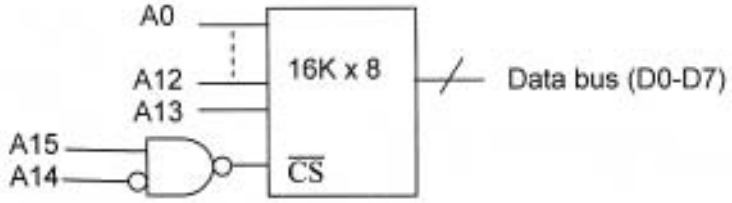
   c) For Mode 1 of serial data communication, show the calculations for finding out the value which is to be loaded in TH1to achieve a baud rate of 9600. Assume the crystal frequency =11.0592 MHz. **6**

SECTION – II

7. a) Draw a diagram showing interfacing of 8255 with 8051 such that following address are realized Port A - C000H, Port B - C001H, Port C - C002H & Control word register C003H. Use full address decoding. **6**

   b) Explain 8051 based Assember, Compiler and Simulator **6**

   c) Find the address range of a memory design shown in the diagram below **4**



OR

8. a) 32KB of EPROM (Program memory) and 32 KB of data RAM is to be interfaced with 8051 draw the interfacing diagram. Use full address decoding. The starting address of EPROM is 0000H. **6**

   b) Write a short note on how 8051 can be interfaced with a PC. **6**

   c) Write a short note on features of 8255. **4**

9. a) Two stepper motors are interfaced to 8051 through a driver card. The motors are controlled through port 1. The step angle of the motor is 1.8 degree. Draw a schematic diagram and write a program to run both the motors in anticlockwise direction through an angle of 180 degree. **10**

   b) Write a short note on temperature measurement using 8051. **8**

OR

10. a) Draw a typical interface of an 8 bitADC with 8051. Write a program read 100 values from ADC and store them from memory location D100H onwards in external Data Ram. **10**

    b) Write a short note on pressure measurement using 8051. **8**

11. a) Explain frequency measurement using 8051 **8**

    b) Write a short note on 8051 based DC motor control. **8**

OR

12. a) Explain how a 4×4 matrix keyboard can be interfaced with 8051. **8**

    b) Write a short note on 8051 based AC motor control . **8**

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T.E. (Electrical) (Semester – I) Examination, 2010
ELECTRICAL MACHINES – II (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Compare salient pole and non-salient pole synchronous machines. **4**
   b) Discuss the synchronous impedance method of calculating regulation of an alternator. **8**
   c) A 3-phase, 8 pole, 750 rpm star-connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is short chorded by 2 slots. Find the induced emf bet^{n} lines given the flux per pole is 0.06 wb. **6**

OR

2. a) Derive from first principles, the emf equation of a 3-phase synchronous machine. **8**
   b) What is armature reaction ? Explain the effect of armature reaction on synchronous machines at different power factors. **8**
   c) What is short-circuit ratio ? **2**

3. a) Describe the hunting phenomenon in synchronous machines. What are the causes of hunting ? What is the roll of damper winding ? **6**
   b) Derive the expression for synchronising torque of an alternator. **6**
   c) What are ‘V’ and inverted ‘V’ curves ? How they are determine ? **4**

OR

4. a) Describe the method of synchronizing 3-phase synchronous machine to the infinite bus-bars using two bright one dark lamp method with relevant circuit diagram. **6**

   b) Derive an expression for power developed in a non-salient pole alternator. **6**

   c) A 5 KVA, 200 V, star-connected, 3-phase, salient pole alternator with direct and quadrature axis reactances of 12 Ω and 7 Ω respectively, delivers full load current at unity power factor. Calculate the excitation voltage, neglecting resistances. **4**

5. a) Write short note on testing of 3-phase induction motor as per IS 325 and IS 4029. **8**

   b) With neat sketches, explain operation of a synchronous induction motor. How its performance differ from a synchronous motor ? **8**

   OR

6. a) Write short note on 3-phase induction voltage regulator. **8**

   b) Explain the V/F control of 3-phase induction motor. **8**

SECTION – II

7. a) Explain the operation of d.c. series motor on A.C.supply. Explain the problems associated with A.C. operation. **8**

   b) Explain the constructional feature, principle of operation, working and applications of universal motor. **8**

   OR

8. a) Write short note on plain series motor and explain drawbacks of plain series motor. **8**

   b) Explain the conductively and inductively compensated motor. **8**

9. a) Explain the effects of harmonics on the performance of induction motor and synchronous generator. **8**

   b) Explain the methods used in synchronous machine to reduce harmonics. **8**

   OR

10. a) Explain the constructional features, principle of operation, working and applications of brushless D.C. motor. **8**

    b) Write short note on linear induction motor. **8**

11. a) Explain why single phase induction motor is not self starting, with the help of
    i) Double revolving field theory.
    ii) By cross field theory. **10**

    b) Find the input current, power factor and efficiency of a ½ h.p., 110 V, 50 Hz, single phase induction motor based on double revolving field theory with the following data at a slip of 5%.

    stator impedance = 2 + j 3 Ω

    equivalent rotor impedance = 2 + j 3 Ω

    magnetising impedance = 50 Ω

    friction and windage loss = 25 watt. **8**

OR

12. a) Describe the constructional features and operating characteristics of single phase shaded pole motor. **6**

    b) Draw and explain the equivalent circuit of a single phase induction motor based on double revolving field theory for with and without losses. **8**

    c) Compare 1-phase induction motor with 3-phase induction motor. **4**

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T.E. (Electrical) (Semester-I) Examination, 2010
ELECTRICAL INSTALLATION MAINTENANCE & TESTING
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any one*** *question from* ***each*** *Unit.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) Neat diagrams must be drawn ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

5) Assume suitable data, ***if necessary.***

SECTION – I

Unit – I

1. a) Compare 3 phase 3 wire overhead system with 3 phase 4 wire overhead system for volume of conductor material required. Clearly state the assumptions made. **8**

   b) State and prove Kelvin's law for feeder design with reference to supply system. State limitations of Kelvin's law. **8**

OR

2. a) Distinguish between a distributor and feeder. **6**

   b) AB is a 200 m long distributor which is fed at point 'A' and is loaded as 50 A at 0.85 lag p.f. and 90 A at 0.9 lag p.f. at point 'B' and Point 'C' respectively. Point 'B' is midpoint of feeder. Power factors at both load points are referred to the voltage at point 'C'. The impedance of each section is 0.2 + j0.3. The voltage at receiving end is maintained at 230 V. Find the sending end voltage, current and power factor. **10**

Unit – II

3. a) Explain in detail function of the equipments used in the substation. **10**

   b) Explain the terms – **6**
   i) Touch potential
   ii) Step potential.

OR

4. a) Explain in detail design of earthing grid of substation. **8**

   b) Explain in detail classification of substation. **8**

Unit – III

5. a) What are the different maintenance strategies ? Explain condition based maintenance in detail. **10**

   b) Define and explain its significance w.r.t. condition monitoring –
   i) Polarization index.
   ii) Dielectric absorption ratio. **8**

OR

6. a) Explain in detail the process of deterioration of insulation. **10**

   b) Discuss planned and preventing maintenance of generators. **8**

SECTION – II

Unit – IV

7. a) Discuss in detail different failure modes of transformer. **10**

   b) Explain process of condition monitoring of on load tap changer used in power transformers. **8**

OR

8.a) Explain transformer oil contamination process. Explain the filtration of transformer oil with block diagram. **10**

b) What is dissolved gas analysis ? How it is used for condition monitoring of transformers? **8**

Unit – V

9. a) Explain in detail various causes of failure of power cables. **8**

b) Write detail note on thermography and its use in condition monitoring. **8**

OR

10. a) What are the various abnormal operating conditions in induction motor and their causes ? **8**

b) Explain Signature Analysis and its use in condition monitoring of electrical equipments. **8**

Unit – VI

11. a) Write notes (covering construction, working and troubleshooting) on any **two**.
   i) Fan
   ii) Refrigerator
   iii) Washing Machine. **16**

OR

12. a) Write notes (covering construction, working and troubleshooting) on any **two**. **16**
   i) Mixer
   ii) Water Pump
   iii) Electric Oven.

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T.E. (Electronics) (Semester – I) Examination, 2010
FEEDBACK CONTROL SYSTEMS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Represent the armature controlled DC motor with a block diagram and derive its transfer function. **8**

   b) With suitable example, distinguish between
   1) Linear control system and non-linear control system
   2) Open loop control system and closed loop control system. **8**

OR

II. a) Draw the signal flow graph for the given block diagram and from that obtain the transfer function $\frac{C(s)}{R(s)}$ using Manson's gain formula. **8**

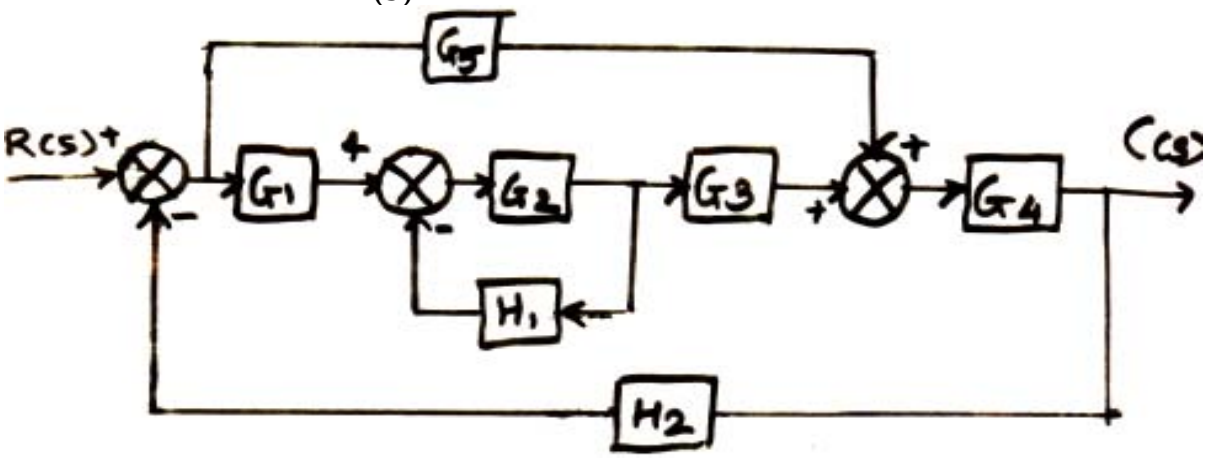

Figure 1

b) Obtain the transfer function of a R-L-C series circuit excited by a voltage source. **4**

c) How an AC servomotor differs from a normal two phase induction motor ? **4**

P.T.O.

III. a) For a unity feedback system having open loop transfer function

$$G(s) = \frac{K(s+2)}{s(s^3 + 7s^2 + 12s)}$$

Find :

1) Type of the system
2) Static error coefficients
3) Steady state error for an input $\frac{R}{2}t^2$. **10**

b) State Routh-Hurvitz stability criteria. Determine the range of k. So that the system with the following characteristics equation will be stable.

$s(s^2 + 2s + 3)(s+2) + k = 0$ **6**

OR

IV. a) Sketch the root locus for a unity feedback control system with

$$G(s) = \frac{k}{s(s+3)(s+5)}$$

For damping ratio (zeta) = 0.6, determine

1) Closed loop dominant poles
2) Damped natural frequency
3) Gain k. **12**

b) Define the following time domain specifications :

1) Delay time
2) Rise time
3) Peak overshoot
4) Settling time. **4**

V. a) What is a compensator ? What are the three different types of compensators ? Compare between them. **6**

b) Given $G(s)\,H(s) = \frac{80}{s(s+2)(s+20)}$

Draw the Bode plot

Find out W_{gc}, W_{pc}, GM and PM

Comment on stability. **12**

OR

VI. a) Determine the closed loop stability of the system with

$$G(s)H(s) = \frac{s+2}{(s+1)(s-1)}$$

using Nyquist stability criterion. **8**

b) Write a short note on correlation between Time Domain and Frequency Domain specifications. **4**

c) State and explain "Mapping Theorem". **6**

SECTION – II

VII. a) Obtain the state space representation of a system with transfer function

$$T(s) = \frac{6}{s^3 + 6s^2 + 11s + 6}$$ **6**

b) Obtain the state transition matrix of the system **6**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

c) Check whether the system represented by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -0.5 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

is controllable or not. **4**

OR

VIII. a) Obtain the state model of a field controlled DC servomotor. **8**

b) Obtain the time response of the system given by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

where u(t) is a unit step occurring at t = 0

$$X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$ **8**

IX. a) Sketch the response of a PID controller for
1) Unit step input
2) Unit ramp input. **4**

b) Draw the PLC ladder diagram for "conveyer system for bottle filling" consider all sensors as direct inputs to PLC. **12**

OR

X. a) Justify the statement "PLC is a sequence controller". **4**

b) Draw the PLC ladder diagram for a motor having
No START button, NC STOP button, Thermal overload limit switch opening on high temperature, GREEN light when running and RED light for thermal overload. **4**

c) Define the following : **8**
1) Proportional band
2) Integral gain
3) Derivative gain
4) Offset.

XI. a) What are the advantages of fuzzy controllers over conventional PID controller ? **4**

b) Draw a general block schematic of a fuzzy controller and explain the function of each block. **8**

c) Explain the following terms w.r.t. neural networks :
1) Supervised learning
2) Unsupervised learning. **6**

OR

XII. a) What are the basic steps involved in the design of a fuzzy controller ? Explain with the help of an example. **10**

b) Distinguish between feedback neural network and feedforward neural network. **4**

c) What do you understand by the term "Adaptive Fuzzy Systems" ? **4**

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T.E. (Electronics) (Sem. – I) Examination, 2010
DATA COMMUNICATION
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **any 3** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) **Neat** diagrams must be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) **Use** of electronic pocket calculator and steam tables is **allowed**.*
*vi) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Define auto correlation function. State and explain any three properties of auto correlation function. **6**

b) Consider a random process $V(t) = \cos(\omega_0 t + \phi)$ where ϕ is a random variable with probability density.

$$f(\theta) = 1/2\pi \quad -\pi <= \theta <= \pi$$
$$= 0 \quad \text{elsewhere}$$

Show that the first and second moments of V (t) are independent of time.

If the random variable is replaced by a fixed angle θ_0, will the ensemble mean V(t) be time independent ? **6**

c) What are the conditions for a random process to be wide sense stationary ?

What is ergodicity ? **4**

OR

2. a) Let V (t) = X + 3t, where X is a random variable with X = 0 and $X^2 = 5$. Show that $V'(t) = 3t$ and $R_v(t_1, t_2) = 5 + 9\, t_1\, t_2$ where $R_v(t_1, t_2)$ is an auto correlation function and $V'(t)$ is mean value of V (t). **8**

b) Compare Binomial, Poisson's, Gaussian's and Reighlay's Probability Models w.r.t. their probability distribution functions. **8**

3. a) Draw the line code formats for 10110100.

i) RZ unipolar

ii) NRZ polar

iii) AMI

iv) Manchester

v) RZ polar

vi) Polar Quaternary (NRZ). **6**

b) Explain the need of synchronizer in digital multiplexing. Draw and explain bit synchronizer. **10**

OR

4. a) Evaluate power spectral density of unipolar NRZ and polar RZ codes. Plot the spectrum. **8**

   b) Explain inter symbol interference (ISI) and also how the Eye pattern is used to interpret the ISI. **8**

5. a) For a systematic LBC, the three parity check digits C_4, C_5, C_6 are given by

   $C_4 = d_1 + d_2 + d_3$

   $C_5 = d_1 + d_2$

   $C_6 = d_1 + d_3$.

   1) Construct generator matrix.

   2) Construct code generated by this matrix.

   3) Determine error-correcting capability.

   4) Prepare a suitable decoding table.

   5) Decode the received words 101100 and 000110. **10**

   b) Explain the following terms in connection with convolution codes :

   i) Code rate and constraint length.

   ii) Steady state transitions.

   iii) Termination of Trellis diagram. **8**

OR

6. a) A rate 1/3 convolution encoder has generating vectors as g1 = (1, 0, 0), g2 = (1, 1, 1), g3 = (1, 0, 1).

   i) Sketch the encoder configuration.

   ii) Draw the code tree, state transition and Trellis diagram.

   iii) If input message sequence is 1 0 1 1 0, determine the output sequence of the encoder. **10**

   b) Explain in brief all the different types of error correcting techniques. **8**

SECTION – II

7. a) Show that the channel capacity of an ideal AWGN channel with infinite bandwidth is given by

$$C_{\infty} = (1/\ln 2)(S/N).$$

Where S is average signal power and N/2 is the power spectral density of Gaussian noise. **4**

   b) An ideal communication system with an average power limitation and White Gaussian Noise has a BW of 1 MHzs and S/N of 10 dbs.

   i) Determine the Channel capacity.

   ii) If S/N drops to 5 dbs, what BW is required for the same channel capacity ?

   iii) If BW is decreased to 0.5 MHzs, what S/N ratio is required to maintain the same channel capacity. **6**

c) What do you mean by mutual information ? Prove that

i) I (x, y) = I (y, x)

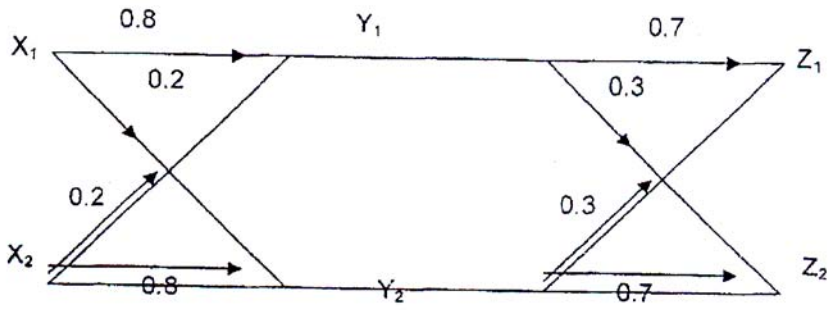
ii) I (x, y) = H (x) + H (y) – H (x, y). **6**

OR

8. a) Two BSC's are connected in cascade as shown in fig.

i) Find the channel matrix of the resultant channel.

ii) Find P (z_1) and P (z_2) if P (x_1) = 0.6 and P (x_2) = 0.4. **8**



b) State and prove Shannon's Information capacity theorem. **4**

c) A voice grade telephone channel has a bandwidth of 3.4 KHz. If the signal to noise ratio on the channel is 30 dB, determine the capacity of the channel. If the above channel is to be used to transmit 4.8 kbps of data, determine the minimum SNR required on channel. **4**

9. a) Draw the signal space representation for orthogonal and non orthogonal BFSK signal. **6**

b) Compare MSK and QPSK system. **4**

c) In digital CW communication, the bit rate of NRZ data stream is 1 Mbps, and carrier frequency is 100 Hz. Compute the symbol rate of transmission and the bandwidth requirement of the channel for

i) BPSK system.

ii) QPSK system. **8**

OR

10. a) Give mathematical representation of QPSK signal. Draw the signal space diagram of offset QPSK signal. Write the expression of all message points in the diagram. **8**

b) Derive the expression for BER of FSK. **4**

c) Explain the phase continuity concept in MSK. **6**

11. a) A binary FSK, FH -SS system has an information rate of 3 kbps and is operating in a jamming environment where entire channel is being jammed with a power level 5 times greater than the received signals. Without the jamming, the signal to noise ratio = 60 dB and No = 10 W/Hz. If required Pe = 10 W/Hz determine minimum processing gain and corresponding transmission bandwidth (B_t). **6**

b) State and explain properties of PN sequence. **4**

c) Explain the working principle of CDMA with block diagram. **6**

OR

12. a) A slow FH/MFSK system has following parameters.

Number of bits per MFSK symbols = 4

Number of MFSK symbol per hop = 5

Calculate the processing gain of system. **6**

b) Explain the working principle of slotted ALOHA and CSMA. **4**

c) Draw and explain the block diagram of FH-SS transmitter and receiver. **6**

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T.E. (Electronics Engg.) (Semester – I) Examination, 2010
MICROCONTROLLERS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section II.i.e Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6 from** Section – **I**, Q. **7** or Q. **8**, Q. **9** or Q. **10,** Q. **11** or Q. **12** from Section – II.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) Neat diagrams must be drawn **wherever** necessary.*

*4) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain with features of Van Neuman and Harvard Architecture. Give one example of each. **8**

   b) Explain how performance of any controller is evaluated ? Also differentiate memory mapped I/O and I/O mapped I/O. **8**

   OR

2. a) Differentiate between microprocessor and microcontroller with general architecture and features. **8**

   b) Design a system to interface 16 K RAM and 8 KB of ROM with 8051 using 8 K having starting address of RAM is 8000 h. **8**

3. a) Draw and explain Architecture of 8051 microcontroller in detail. **9**

   b) Write an ALP to find +ve and –ve numbers stored in an external memory of 8051 with 10 numbers array. Store final count of +ve and – ve numbers in internal memory at 35 and 36. **9**

   OR

P.T.O.

4. a) Explain different Timer /Counter modes of 8051. **9**

   b) Write an ALP to transfer message serially "UNIPUNE" at 9600 baud rate, 8 bit data, 1 start and stop bit continuously with delay of 1 msec (Use timer). **9**

5. a) Draw an interfacing diagram to interface 4×4 key pad with 8051 and write an ALP to check key pressed with key doebounce. **8**

   b) Draw an interfacing diagram to interface DAC 0808 with 8051 and write an ALP to generate triangular wave continuously. **8**

OR

6. a) Draw an interface diagram for LCD with 8051 and write an ALP to display "WELCOME" on 16×2, 5×7, 8 bits, starting on line one with four shifts. **8**

   b) Draw an interfacing diagram for stepper motor and write an ALP to rotate it 90° clockwise and anticlockwise direction continuously (Use step angle of 1.8°). **8**

SECTION – II

7. a) State features of I^2C bus and explain the following conditions :

      i) Start

      ii) Stop

      iii) ACK. **8**

   b) Draw an interfacing diagram using I^2C bus with 8051 for EEPROM and RTC. Also comment on interfacing. **8**

OR

8. a) Explain features of SPI and CAN BUS. **8**

   b) Draw an interface diagram for serial ADC with 8051. Also differentiate between RS 232 and RS 485. **8**

9. a) Draw and explain the architecture of PIC 18 F microcontroller. **9**

   b) Draw an interface diagram to interface 8 LED's with PIC microcontroller and write 'C' program to display Ring counter unit. **9**

OR

10. a) Explain program and data memory map of PIC 18 F. **9**

    b) Draw a stepper motor interface with PIC and write 'C' program to rotate it in clock wise direction if switch is pressed otherwise in anticlockwise. **9**

11. a) Draw and explain generalised DAS in detail. **8**

    b) Design 8051 based system to Interface Temperature sensor LM 35 and RTD. Write 'C' program to turn ON 'LED' and ring Buzzer of Temp. Exceeds 35° and below 25° C. **8**

OR

12. a) Explain different factored using in selection of ADC. **6**

    b) Design a microcontroller based DAS to measure speed of synchronous motor and display variation on LCD , make provision of interfacing analog and digital signals such as [load cell, pressure, switches] etc. **10**

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T.E. (Electronics) (Semester – I) Examination, 2010
POWER ELECTRONICS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) What are converters ? Explain with circuit diagram and waveforms working of 3 ϕ half controlled converter with highly inductive load. Deduce the equation for o/p voltage. Plot W/Fs at $\alpha = 60°$. **8**

   b) 3 ϕ HCC is operated from y-connected 208V, 60Hz supply and load res. is $R = 10\,\Omega$. If it is required to obtain an av. o/p volt. of 50% of the max. possible o/p volt, **10**

   Calculate :

   1) Delay angle α
   2) rms and av. o/p currents
   3) av and rms high current
   4) η

   OR

2. a) What are dual converters ? Explain with circuit dia. and W/Fs, working of 1ϕ dual converter with highly inductive load. Deduce the equation for circulating current 1C. **10**

   b) 1ϕ dual converter is operated from 120V, 60Hz, supply and load resistance $R = 10\,\Omega$; The circulating inductance is Lc = 40mH, delay angles are $\alpha_1 = 60$ and $\alpha_2 = 120^{\circ}$. Calculate the peak circulating current. **8**

3. a) What are switched mode converters ? Explain with ckt. diagram and W/Fs, working of step-down chopper with RL load. **10**

   b) Why choppers are prepared over phase controlled converters for power control applications ? Justify. **6**

   OR

P.T.O.

4. a) What are chopper drives ? Explain with circuit diagram and waveform, working of step-up chopper (2ϕ). **10**

   b) What are the advantages of PWM techniques ? Explain. **6**

5. a) What are resonant converters ? Explain with circuit diagram and W/Fs, working of ZVS with applications. **10**

   b) Compare linear, switched mode and resonant converters. **6**

OR

6. a) What are the advantages of resonant converters ? With neat ckt. and W/Fs, explain the working of ZCS. State its limitations. **10**

   b) What are cyclo converters ? Explain any one type. **6**

SECTION – II

7. a) With the help of neat circuit diagram and W/Fs, explain the operation of 3ϕ MOSFET based voltage source inverter with resistive load (180° conduction mode). **10**

   b) Compare between VSI & CSI. **6**

OR

8. a) What is the need of controlling o/p voltage of an inverter ? Explain briefly and compare various methods employed for the control of o/p voltage in inverter. **8**

   b) What is inverter ? Explain with circuit diagram and W/Fs, working of 3ϕ VSI (transistorized) with 120° mode conduction fed by res. load. **8**

9. a) Explain with neat ckt. dia. (**any two**) cooling system. **8**
      1) Forced air cooling
      2) Liquid cooling
      3) Vapour phase cooling.

   b) Write short notes on : **8**
      1) Heat sinks.
      2) Electronic ballast.

OR

10. a) What are protection devices ? Explain (any two) over voltage protection devices used : **8**
    1) MOV,
    2) Selenium surge suppressor
    3) Transorbs.

    b) What is HVDC ? Explain with diagram working of 12 pulse converter used for HVDC transmission system. **8**

11. a) What is the necessity of power quality ? Explain with different types of power line disturbances. **10**

    b) What is energy audit ? Explain the required procedure for energy audit. **8**

OR

12. a) What is power factor ? Explain with neat ckt. dia. and W/Fs, working of 1ϕ SAC for p.f and improvement. **8**

    b) Justify why p.f is poor in phase controlled converters. **2**

    c) Explain with ckt. dia. and working of 1ϕ FCC (RL Load). Justify the condition for rectification and inversion mode. **8**

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T.E. (E.&TC) (Sem. – I) Examination, 2010
CONTROL SYSTEMS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Black figures to the **right** indicate **full** marks.*
*v) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*vi) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Define the following with an example for each. **8**
   1) Linear system
   2) Nonlinear system
   3) Feedback system
   4) Feed Forward system

   b) Reduce the following block diagram shown in Fig. 1 into a single equivalent block by block reduction techniques. **8**

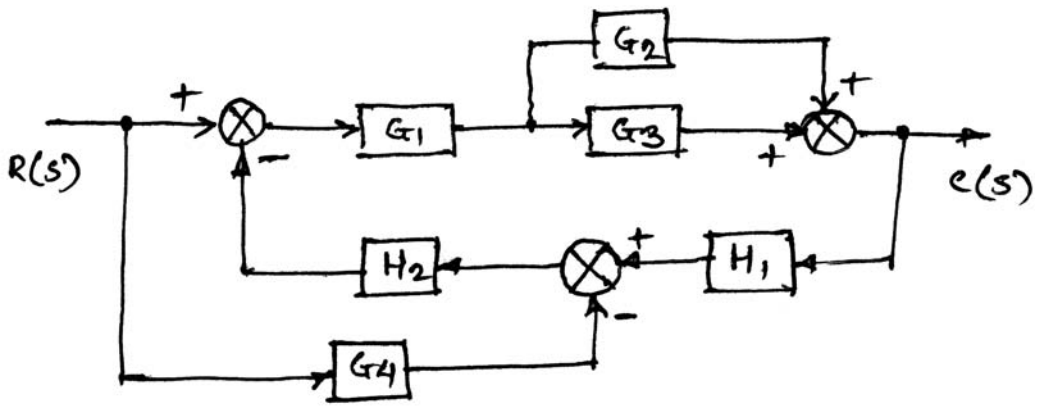

Fig. 1

OR

2. a) Distinguish between the following : **8**

   1) Feedback and Feedforward control system

   2) Open loop and Closed loop control system

   b) Using Mason's gain formula find the gain of the following system shown in Fig. 2. **8**

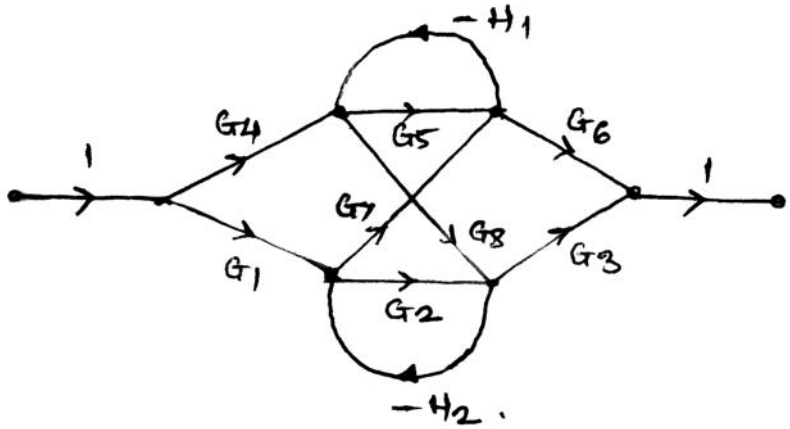

Fig. 2

3. a) A system has open loop transfer function as $G(s)\,H(s) = \frac{16}{s\,(s+6)}$. Find the undamped natural freq., the damping ratio, damped natural freq., rise time, peak time, peak overshoot and settling time with 2% criteria. **8**

   b) The characteristic equation of feed back control system is $F(s) = s^4 + 2s^3 + s^2 + 4s + 2 = 0$ using Routh's criteria, determine the stability. **8**

OR

4. a) Sketch the root locus of $G(s) = \frac{K}{s\,(s+3)\,(s+6)}$ and comment on its stability. **8**

   b) Draw the sketch of an underdamped second order system response with unit step excitation. Show the various specification clearly on it and define them. **8**

5. a) A unity feedback control system has $G(s) = \frac{K}{s\,(s+2)\,(s+20)}$. Sketch the Bode plot and find phase margen and gain margin if K = 40, K = 400, K = 4000. Comment on the stability. **12**

   b) Write a note on frequency domain specifications. **6**

OR

6. a) How G.M. and P.M. can be obtained from Bode plot ? **6**

   b) A unity feedback control system has open loop transfer function as $G(s)\,H(s) = \frac{s+1}{s^2(s-4)}$. Sketch Nyquist plot and determine the stability of closed loop system. **12**

SECTION – II

7. a) What are the advantages of state space techniques over transfer function ? **4**

   b) State the properties of state transition matrix. **4**

   c) Obtain state transition matrix for the system ? **8**

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

8. a) Define the terms : **4**

   1) State
   2) State variables
   3) State vector
   4) State space.

   b) What is state transition matrix ? **4**

   c) Obtain a state space model of the system with transfer function

$$\frac{y(s)}{u(s)} = \frac{6}{s^3 + 6s^2 + 11s + 6}.$$ **8**

9. a) Draw and explain the architecture of PLC. **8**

   b) Sketch and comment on the output of P, PI, PD and PID controller for a ramp input. **8**

OR

10. a) Draw the ladder diagram for an elevator system and explain it. **8**

    b) Write a note on PID controller. **8**

11. a) Write a note on application areas of SCADA system. **8**

    b) Explain : **10**

    1) Gain scheduling

    2) Self tuning regulator.

OR

12. a) Draw an explain the block diagram of predictive control technique. **6**

    b) Explain methods of achieving adaptive control scheme. **6**

    c) Write a note on SCADA system. **6**

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T.E. (Instrumentation and Control)(Semester – I) Examination, 2010
EMBEDDED SYSTEM DESIGN (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Describe the organization of internal RAM of MCS-51 with respect to the following points : **8**

   i) Diagram

   ii) Bit addressable memory

   iii) Scratch pad area

   iv) Indirectly addressable area.

   b) What are the functions of the following pins of 8051 ? **8**

   i) $\overline{\text{PSEN}}$ ii) TXD/P3.1

   iii) $\overline{\text{WR}}$/P3.7 iv) $\overline{\text{INTO}}$/P3.3

   v) $\overline{\text{EA}}$ vi) ALE

   vii) RST viii) XTAL1

OR

2. a) With neat diagram explain the working of the timer/counter block of 8051. **8**

   b) Describe the internal structure of the port pins of Port 0 and Port 2 of 8051. **8**

P.T.O.

3. a) List and explain, giving examples the addressing modes of 8051. **8**

   b) Write a program to toggle all the bits of Port 1 of 8051 after 50 ms. Use hardware delays and assume Fosc = 12 MHz. **8**

OR

4. a) Explain the interrupt structure of 8051. What are the vector addresses of all the interrupts ? Explain all the SFRs related to interrupts. How is the priority of interrupts decided ? **8**

   b) Explain the following instructions of 8051 : **8**

      i) JBC 11h, label

      ii) CJNE A, 37h, label

      iii) SWAP A

      iv) MOV 71h, #0Ah.

5. a) With a neat sketch explain the interfacing of 16 X 2 LCD display to 8051. **8**

   b) An application needs a 12 V relay to be on for 1 second and off for 1 second. The relay is operated with a port pin of 8051. Draw the interfacing scheme and write a program for the same. Assume F_{OSC} = 500 KHz. **10**

OR

6. Write short notes : **18**

   a) Comparison between 8051 and 89C2051

   b) SPI interface

   c) I^2C interface.

SECTION – II

7. a) Enlist the Architectural features of AT Tiny 2313. **8**

   b) Explain the interrupt structure of AT Mega 8535 microcontrollers. **8**

OR

8. a) Explain the stack operation in AVR microcontrollers. Explain the situations/ instructions when the stack memory is used. **8**

   b) Explain the memory organization of AVR microcontrollers. **8**

9. a) Explain the addressing modes of AVR microcontrollers giving examples from the instruction set. **8**

   b) Explain the different clock sources which can be used with AVR microcontrollers. **8**

OR

10. a) Explain the following instructions of AVR microcontrollers : **8**

   i) BREQ k

   ii) ST Y +, R5

   iii) OUT SPH, R16

   iv) SEI

   b) Two sixteen bit numbers are stored at 70 h, 71 h and 80 h, 81 h in the internal SRAM of AT Tiny 2313, with the lower memory location having the lower 8 bits of the number. Write a program to add these two numbers and store the result at 60 h (Lowest byte), 61 h and 62 h (Highest byte). **8**

11. a) With a neat schematic, explain the interfacing of DAC to AVR microcontroller. **10**

   b) With a neat diagram explain the interfacing of serial EEPROM to the AVR microcontroller. **8**

OR

12. Discuss the Design of Data Acquisition system with RS 232 interface using AVR microcontroller based on the following points :

   a) Block diagram. **4**

   b) Description. **4**

   c) Selection of ICs for the system. **6**

   d) A general algorithm. **4**

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T.E. (Instrumentation and Control)(Semester – I) Examination, 2010
(2008 Pattern) (New)
INDUSTRIAL MANAGEMENT

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

1. a) Define management, explain various functions of management. Explain the role of managers in a changing business environment. **10**
   b) State and explain portor's 5 forces of competition. **8**

OR

2. a) What is SWOT analysis ? How it is helpful in developing competitive advantage of a company. **10**
   b) Explain the following concepts : **8**
      i) BCG Matrix
      ii) Ishikawa diagrams.

3. a) Define quality control. Explain the techniques of statistical process control. **10**
   b) Explain the following quality standards : **6**
      i) ISO - 9000
      ii) ISO - 14000

OR

4. a) State and explain expansion, diversification, Mergers and Takeovers as business strategic alter natives with their relative strengths and weaknesses. **10**
   b) Describe the concept of supply chain management. **6**

P.T.O.

5. a) Based on production forecast, a company uses 30000 units of a specific component. The ordering cost is Rs. 300/- per order and inventory carrying cost is estimated at 25% of average annual consumption value. The cost per unit of the component is Rs. 12/-. Assuming 300 working days in a year, determine :

   i) Economic order quantity,

   ii) No. of orders/year

   iii) Inventory cycle and

   iv) Total Inventory cost. **10**

   b) What is EOQ ? Derive its formula and explain its assumptions and limitations. **6**

OR

6. a) Define production planning and control. Explain the techniques of PPC. **10**

   b) Explain the concept of 'Outsourcing' in the context of manufacturing companies. Is it a suitable measure to reduce cost ? Justify. **6**

SECTION – II

7. a) Define man power planning. Explain its objectives, functions and techniques. **10**

   b) State and explain various types of training imparted to Industrial workers. **6**

OR

8. a) State and explain theory X and Theory -Y of motivation developed by McGregor. How it differs from Maslow's Theory ? **10**

   b) Write a short note on Leadership skills. **6**

9. a) What is Break-even Analysis ? Construct CVP graph and explain its assumptions and importance. **8**

b) A project consists of the following activities with duration :

Activities	Nodes		Duration/week
A	1-2	–	5
B	2-3	–	3
C	2-4	–	7
D	2-5	–	10
E	3-6	–	8
F	4-6	–	3
G	5-6		15
H	6-7		12
I	6-8		11
J	7-9		3
K	8-9		17
L	9-10		15

Draw the network diagram.
Determine Critical path, Total float, Free float and Independent float of the above activities. **10**

OR

10. a) Explain project network analysis. Why it is essential ? Explain CPM and PERT as a tool of network analysis with their differences. **10**

b) Describe the Role of SEBI as a regulator of capital market. **8**

11. What is Disaster Management ? Explain its causes, effects and mitigation mechanism. **16**

OR

12. Explain the following :

a) i) Global warming
ii) Safety and Environmental norms (ISO-14000). **8**

b) Explain capital budgeting. What are the various methods of capital budgeting ? Explain any two methods of capital budgeting. **8**

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T.E. (Chemical) (Semester – I) Examination, 2010
CHEMICAL ENGINEERING MATHEMATICS
(2008 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole.***
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Using bisection method find the root of equation $x^3 - 1.8x^2 - 10x + 17 = 0$ that lies between the interval (1, 2) at the end of 5^{th} iteration. **10**

   b) State and explain the graphical interpretation of Newton Raphson method. **8**

OR

2. Calculate molar volume and compressibility factor for gaseous ammonia at a pressure 56 atm and temperature 450 K using Vandar walls equation of state. Repeat the calculations for reduced pressure P_r = 1, 2, 4 and 10. **18**

3. a) Solve following system of equations using LU decomposition method. **8**

   $2x + 3y + z = 9$

   $x + 2y + 3z = 6$

   $3x + y + 2z = 8$

   b) Solve the following system of equations using Gauss Seidal iterative method. The answer should be correct to two significance digits. **8**

   $9x_1 + 2x_2 + 4x_3 = 20$

   $2x_1 - 4x_2 + 10x_3 = -15$

   $x_1 + 10x_2 + 4x_3 = 6$

OR

P.T.O.

4. a) Solve the following equations using Cholesky method

$16x_1 + x_2 + 0x_3 + 0x_4 = 1$

$x_1 + 9x_2 + x_3 + 0x_4 = 3$

$0x_1 + x_2 + 9x_3 - x_4 = 0$

$0x_1 + 0x_2 - x_3 + 16x_4 = 0$ **8**

b) Use Gauss elimination method to solve the following equations.

$x_1 + 20x_2 + x_3 = 22$

$-x_1 - x_2 + 20\ x_3 = 18$

$20x_1 + x_2 - x_3 = 20$ **8**

5. a) Applying the method of least squares find an equation of the form $y = ax + bx^2$ that fits the following data. **8**

x	1	2	3	4	5	6
y	2.6	5.4	8.7	12.1	16.0	20.2

b) Find the interpolating polynomial for the data

x	0	1	2	5
y=f(x)	2	3	12	147

Find the value of y at x = 1.5. **8**

OR

6. a) For the following data find $\sqrt{1.1}$ using Langrage's interpolation. Determine the accuracy of interpolation.

x	1	1.2	1.3	1.4
$\sqrt{\mathbf{x}}$	1	1.095	1.140	1.183

8

b) The temperature viscosity relationship is given for hydrodynamic material as follows.

t°C	40	41	42	43	44	45
Z Cp	52.5	50	47.5	45	43	41

Calculate the temperature of lubricant for viscosity of 43.2 using backward difference method. **8**

SECTION – II

7. a) Solve the systems of ODEs using the fourth order Runge- Kutta method

$$\frac{dy_1}{dx} = -0.5y_1 \quad \frac{dy_2}{dx} = 4 - 0.3y_2 - 0.1y_1 .$$ **8**

b) Derive the formula for Eulers method and state the errors induced by Eulers method. **8**

OR

8. A non insulated metallic bar 1 m long is held in air which is at temperature 20°C. One end of the bar is maintained at 100°C while other is at 40°C. The temperature distribution along the length at steady state may be assumed to be

$$\frac{d^2T}{dX^2} + h(T_a - T) = 0 .$$

where T is temperature in degree Celsius, X is the distance measured from hot end. T_a is atmospheric temperature in °C and h = 0.01. Calculate the rod temperature at a distance of 250, 500 and 750 mm from hot end. **16**

9. Use the Crank-Nicoloson method to solve for the temperature distribution of a long, thin rod with a length of 10 cm and the following values : $K' = 0.49$ cal/s. cm°C, $\Delta x = 2$ cm and $\Delta t = 0.1$S. At t = 0, the temperature of rod is zero and the boundary conditions are fixed for all times at T(0) = 100°C and T(10) = 50°C. Note that the rod is of aluminium with C = 0.2174 cal/g°C and ρ = 2.7 g/cm^3. Therefore k = 0.835cm^2/s and $\lambda = 0.835(0.1)/(2)^2 = 0.020875$. **16**

OR

10. a) Establish a relation between the adjacent cells with appropriate step size for finite difference approximation. **12**

b) What are various methods to solve partial differential equations ? **4**

11. a) Use quadratic interpolation to approximate the maximum of

$f(x) = 2\sin x - \frac{x^2}{10}$ with initial guesses of x_0=0, x_1 = 1 and x_2 = 4. **12**

b) Explain scanning and bracketing procedures for optimization of unconstained functions of one dimensional search. **6**

OR

12. a) How one dimensional search is applied in a multidimensional problems ? **12**

b) What are the six steps of optimization ? **6**

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T.E. (Chemical) (Semester – I) Examination, 2010
MASS TRANSFER – I (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer* ***three*** *questions from Section* ***I*** *and* ***3*** *questions from Section* ***II****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
5) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Explain the phenomena of mass transfer by molecular diffusion. Define Fick's law of diffusion. **4**

   b) Derive the expression to calculate the flux of : **6**

      i) Diffusion of gas 'A' through non diffusing stagnant gas 'B'.

      ii) Equimolal counter diffusion of gases A and B.

   c) An ethanol (A) - water (B) solution in the form of a stagnant film 2 mm thick at 293°K is in contact at one surface with an organic solvent in which ethanol is soluble and water is insoluble. Hence $N_B = 0$. At point one, the concentration of ethanol is 16.8 wt.% and the solution density is $\rho_1 = 972.8$ kg/m^3. At point two, the concentration of ethanol is 6.8 wt.% and $\rho_2 = 988.1$ kg/m^3. The diffusivity of ethanol is 0.740×10^{-9} m^2/s.

      Calculate steady state flux N_A for 100 kg of solution. **8**

      OR

2. a) Derive the expression for Maxwell law of diffusion. **4**

   b) Classify different mass transfer operations based on the phases in contact. Enlist different mass transfer operation in separation processes. **6**

c) Ammonia is diffusing through a stagnant layer gas mixture consisting of 25% nitrogen and 75% hydrogen by volume at 0°C and 1 atm pressure. Calculate the rate of diffusion of ammonia in gm mole/cm^2. sec. through a gas film of 0.03 cm thick. The partial pressure of ammonia across the film being 100 and 50 mmHg respectively. **8**

$D_{NH_3} - N_2 = 0.158\ cm^2/sec.$

$D_{NH_3} - H_2 = 0.588\ cm^2/sec.$

3. a) Establish the relation for local overall mass transfer coefficient in terms of local individual film mass transfer coefficients for each phase for gas-liquid interphase mass transfer operation. **6**

b) Water is used to absorb CO_2 from a $N_2 - CO_2$ mixture in a unit operating at 10°C and 2 MPa. The average gas and liquid side mass transfer coefficients are 4 and 48 kg mole/m^2 hr. respectively. Henry's law for the CO_2- Water system at 10°C is $P = 1.05 \times 10^5 \alpha$, where p is the partial pressure (KPa) of CO_2 in the gas phase and x is the aqueous-phase mole fraction of CO_2. Water is assumed to be non volatile and the solubility of N_2 in water is neglected.

i) Calculate the overall mass transfer coefficient Kx and Ky .

ii) At a certain location in the absorption unit the mole fraction of Co_2 in the liquid and the gas phases were measured to be 0.0005 and 0.10 respectively. Estimate the interfacial mole fraction of CO_2 at this location. **10**

OR

4. a) Explain film theory and penetration theory. **8**

b) Explain in short the concept of mass transfer coefficient in laminar flow and turbulent flow. **4**

c) Write a short note on-mass, heat and momentum transfer analogies. **4**

5. a) 5000 kg/hr of a SO_2 – air mixture containing 5% by volume of SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relationship is given by Y = 30X. **8**

$$\text{Where, } Y = \frac{\text{mole of } SO_2}{\text{mole of air}}$$

$$X = \frac{\text{mole of } SO_2}{\text{mole of water}}$$

If the packed height of tower is 0.42 m, calculate the height of transfer unit (HTU).

b) Discuss the factors to be considered for the selection of a suitable solvent for gas absorption process. **4**

c) Write a short note on - absorption with chemical reaction. **4**

OR

6. a) Write a short note on minimum Liquid-Gas ratio for absorption. **4**

b) Derive the equation for operative line for counter current absorption process and show the location of this line graphically. **4**

c) Gas containing 2% (by volume) solute A is fed to an absorption tower at a rate of 0.35 m^3/sec at 26°C and 106.658 KPa pressure and 95% of original solute is removed by absorbing it in solvent B. Solvent containing 0.005 mole fraction of solute enters the tower at top and exit liquid streams from absorption tower contains 0.12 mole of A per mole of B. **8**

Find the flow rate of liquid solvent entering the absorption tower on solute free basis.

SECTION – II

7. a) What are the different types of Humidification and dehumidification equipments ? Explain any one in detail. **10**

b) The air in a room is at 26.7°C and a pressure of 101.325 KPa and contains water vapour with a partial pressure P_A = 2.76 KPa. Calculate the following-

i) Humidity (H)

ii) Saturation humidity (H_S)

iii) Percentage humidity (H_P)

iv) Percentage relative humidity (H_R)

Data given – At 26.7°C, the vapour pressure of water is P_{AS} = 3.50 KPa. **8**

OR

8. a) Derive an equation for height of packing required in forced draft counter current cooling tower in terms of Z = HTU × NTU

Where, $NTU = \int_{H_{G_1}}^{H_{G_2}} \frac{dH_g}{H_F - H_g}$

Use basic equation for heat and mass transfer in counter current cooling tower. State the assumptions used. **10**

b) Write a short note on -

i) Lewis relationship ii) Psychrometric ratio. **8**

9. a) Explain the phenomena of movement of moisture within the solid. **4**

b) A batch of solid is to be dried from 28 to 6% moisture on wet basis. The initial weight of the solid is 380 kg and drying surface is 0.15 m^2/40 kg dry weight. The critical moisture content is 18% on a dry basis and the constant drying rate is 0.32 kg/m^2 hr. For the falling rate period, following data are available. Calculate the time required for drying. **12**

Moisture content % dry basis	25	21.9	19	16	13.6	11	8.2	7.5	6.4
Rate of drying Kg/m^2.hr	0.30	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

OR

10. a) Derive the equation for calculating constant rate of drying period and falling rate of drying period. **8**

b) What are different types of dryer's ? Explain any one in detail. **8**

11. a) Write a short note on **(any two)** : **10**

i) Pressure drop in packed column

ii) Types of Packing

iii) Humidity chart.

b) Explain with neat sketch-Mechanically agitated vessel. **6**

OR

12. a) Write a short note on **(any two)** : **10**

i) Fluidized bed dryer

ii) Spray tower

iii) Venturi scrubber.

b) Explain the difference between Tray tower and Packed tower. **6**

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T.E. (Chemical) (Semester – I) Examination, 2010
Chemical Engineering
THERMODYNAMICS – II
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section* ***II****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Explain chemical potential as criteria of phase equilibrium. **7**

   b) At 25°C and atmospheric pressure the excess volumes of binary liquid mixtures of species 1 and 2 are given by the equation.

   $V^E = x_1x_2\,(30x_1 + 50x_2)$, cm^3/mol

   At the same conditions, $V_1 = 120\ cm^3/mol$ and $V_2 = 150\ cm^3/mol$. Determine the partial molar volumes $\overline{V}_1$ and $\overline{V}_2$ for an equimolar mixture of species 1 and 2 at the given conditions. **9**

   OR

2. a) Excess volumes (cm^3/mol) for the system ethanol(1)/methyl butyl ether (2) at 25°C are given by the equation
   $V^E = x_1x_2\,[-1.026 + 0.220\,(x_1 - x_2)]$
   If $V_1 = 58.63$ and $V_2 = 118.46\ cm^3/mol$. What volume of mixture is formed when 1000 cm^3 each of pure species 1 and 2 are mixed at 25°C ? **8**

   b) Show that the fugacity of a gas obeying van Der Waals equation of state is given by

   $$\ln f = \frac{b}{V-b} - \frac{2q}{RTV} + \ln\left(\frac{RT}{V-b}\right).$$ **8**

P.T.O.

3. a) A vessel divided into two parts by a partition contain 4 mol of nitrogen gas at 348.15K and 30 bar on one side and 2.5 mol of argon gas of 403.15K and 20 bar on the other side. If the partition is removed and the gases mixed adiabatically and completely. What is the change in entropy ? Assume nitrogen to be an ideal gas with $C_V = (5/2)R$ and argen to be an ideal gas with $C_V = (3/2)R$. **8**

   b) Describe activity and activity coefficient. Give the effect of temperature and pressure on activity coefficients. **8**

OR

4. a) The following equations have been proposed to represent activity coefficient data for a system at fixed T and P.

$$\ln \gamma_1 = x_2^2(0.5 + 2x_1)$$

$$\ln \gamma_2 = x_1^2(1.5 - 2x_2)$$

Do these equations satisfy Gibbs-Duhem equation ? Determine and expression for G^E/RT for the system. **10**

   b) Explain Raoults law and Henry's law. **6**

5. a) Explain and state Duhems theorem. What is its significance in establishing the state of the system ? **4**

   b) Assuming the validity of Raoults law, do the following calculations for the Benzene(1)/Tolune(2) system.

   i) Given $x_1 = 0.33$ and T = 100°C find y_1 and P

   ii) Given $y_1 = 0.33$ and T = 100°C find x_1 and P

   iii) Given $x_1 = 0.33$ and P = 120 KPa, find y_1 and T.

$$\ln P^{sat}/KPa = A - \frac{B}{t + c}.$$

Compound	A	B	C
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	279.79

14

OR

6. The vapor pressures of acetone (1) and acetonitrile (2) can be evaluated by the Autoine equations

$$\ln P_1^s = 14.5463 - \frac{2940.46}{T - 35.93}$$

$$\ln P_2^s = 14.2724 - \frac{2945.47}{T - 49.15}$$

Where T is in K, and P is in KPa. Assuming that the solutions formed by these are ideal, calculate

a) x_1 and y_1 at 327 K and 65 KPa

b) T and y_1 at 65 KPa and $x_1 = 0.4$

c) P and y_1 at 327 K and $x_1 = 0.4$

d) T and x_1 at 65 KPa and $y_1 = 0.4$. **18**

SECTION – II

7. a) Derive the following expression for solid liquid equilibrium.

$$\varphi_i = \exp \frac{\Delta H_i^{sl}}{RTmi} \left(\frac{T - Tmi}{T} \right).$$ **10**

b) Explain osmotic pressure and osmotic equilibrium. **8**

OR

8. a) Explain following two methods of consistency tests for VLE data

i) Using coexistence equation

ii) Using partial pressure data. **8**

b) How Gibbs-Duhem equations are helpful in testing the consistency of VLE data ? **6**

c) Explain liquid-liquid equilibria. **4**

9. a) Derive the following expression.

$$-RT \ln K = \sum V_i G_i^0 .$$ **8**

b) A system initially containing 3 mol CO_2, 5 mol H_2 and 1 mol H_2O undergoes the following reactions.

$CO_2(g) + 3\ H_2\ (g) \rightarrow CH_3OH(g) + H_2O(g)$

$CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$

Derive expressions for the mole fractions of the reacting species as functions of the reaction coordinates for the two reactions. **8**

OR

10. a) Derive an expression showing the effect of temperature on equilibrium constant. **9**

b) The standard heat of formation and standard free energy of formation of ammonia at 298K are –46,100 J/mol and –16500 J/mol respectively. Calculate the equilibrium constant for the reaction $N_2\ (g) + 3H_2\ (g) \rightarrow 2NH_3\ (g)$ at 500K assuming that the standard heat of reaction is constant in the temperature range 298 to 500 K. **7**

11. a) Derive an expression $K = \pi(x_i\gamma_i)^{vi}$. **8**

b) For the cracking reaction $C_3H_8(g) \rightarrow C_2H_4(g) + CH_4(g)$ the equilibrium conversion is negligible at 300K but becomes appreciable at temperatures above 500K. For a pressure of 1 bar, determine

a) Fractional conversion of prepare at 600K

b) The temperature at which the fractional conversion is 80%. **8**

OR

12. a) In a laboratory investigation acetylene is catalytically hydrogenated to ethylene at 1120°C and 1 bar. If the feed is an equimolar ratio of acetylene and hydrogen, what is the composition of the product stream at equilibrium ? Data - for both reactions (1) and (2) $\ln K_1 = 12.9$ and $\ln K_2 = -12.9$. **8**

b) For the reaction $SO_2(g) + \frac{1}{2}O_2(g) \rightarrow SO_3(g)$ in equilibrium at 900 K what pressure is required for a 90% conversion of SO_2 if the initila mixture is equimolar in the reactants ? Assume ideal gases. **8**

Data - ΔG°_{298} for $SO_2 = -300,194\ J/mol$

ΔG°_{298} for $SO_3 = -371060\ J/mol.$

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T.E. (Petroleum) (Semester – I) Examination, 2010
NUMERICAL METHODS AND GEOSTATISTICS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: 1) In Section – **I** attempt Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6.** In Section – **II** attempt Q. **7** or **8**, Q. **9** or **10**, Q. **11** or **12**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) **Black** figures to the **right** indicate **full** marks.*

*5) **Use** of electronic pocket calculator is **allowed**.*

*6) Assume **suitable** data, if necessary.*

SECTION – I

1. a) If f (z) = u + iv is analytic, show that u and v are harmonic, also show that families of curves u = c, v = b are orthogonal. **5**

   b) Evaluate, using Cauchy integral formula $\oint_C \frac{z+4}{z^2+2z+5}\,dz$ where 'C' is the circle $|z-2i| = \frac{3}{2}$. **6**

   c) Evaluate $\oint_C e^z \sec z\,dz$, where 'C' is $|z| = 2$. **5**

OR

2. a) If f (z) is analytic, show that

$$\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2=4|f'(z)|^2. \quad \textbf{5}$$

b) Evaluate $\oint_C \frac{\sin 2z}{(z+\frac{\pi}{3})^4}dz$ where 'C' is |z| = 2. **5**

c) Using complex integration evaluate $\int_0^{2\pi}\frac{\sin^2\theta}{5+4\sin\theta}d\theta$ **6**

3. a) The arithmetic mean and standard deviation of 25 items is found to be 11 and 3 respectively. It was observed that one item 9 was incorrect. Calculate the mean and standard deviation if **5**

i) the wrong item is omitted.

ii) it is replaced by 13.

b) Calculate the first four moments about the mean of the following distribution. Find the coefficients of skewness and kurtosis. **6**

x	1	2	3	4	5	6	7	8	9	10
f	6	15	23	42	62	60	40	24	13	5

c) Compute correlation coefficient between supply and price of commodity using following data. **6**

Supply	152	158	169	182	160	166	182
Price	198	178	167	152	180	170	162

OR

4. a) Find correlation coefficient between x and y, given that, n = 25, $\Sigma x = 75$, $\Sigma y = 100$, $\Sigma x^2 = 250$, $\Sigma y^2 = 500$, $\Sigma xy = 325$. **5**

   b) Calculate the first four moments about the mean of the given distribution. Also find β_1 and β_2. **6**

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

   c) Find the lines of regression for the following data : **6**

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

   and estimate y for x = 14.5 and x for y = 29.5.

5. a) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times, C can hit the target 3 out of 4 times. Find the probability of at least two hit the target. **5**

   b) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives ? **6**

   c) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotter pins in boxes of 100 pins and guarantees that not more than 5 pins will be defective in a box, find the approximate probability that a box will fail to meet the guaranteed quality [Use Poisson distribution). **6**

OR

6. a) The accidents per shift in a factory are given by the table. **6**

Accidents x per shift	0	1	2	3	4	5
Frequency f	142	158	67	27	5	1

   Fit a Poisson distribution to the above table and calculate theoretical frequencies.

b) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm, and standard deviation 0.0020 cm. How many of the plugs are likely to be rejected if the acceptable diameter is 0.752 ± 0.004 cm ?

[z = 2.25, A = 0.4878; z = 1.75, A = 0.4599]. **5**

c) A set of five similar coins is tossed 210 times and the result is

No. of head	0	1	2	3	4	5
Frequency	2	5	20	60	100	23

Test the hypothesis that the data follow a binomial distribution at 1% level of significance. $\left[\psi^2_{5;0.01} = 15.086\right]$. **6**

SECTION – II

7. a) With usual notations establish the following : **9**

i) $\left(\frac{\Delta^2}{E}\right) f(x) \neq \frac{\Delta^2 f(x)}{E\, f(x)}$

ii) $D = \frac{1}{h}\left[\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \frac{\Delta^4}{4} + ...\right]$

iii) $\frac{1}{2}\delta^2 + \delta\sqrt{1+\frac{\delta^2}{4}} = \Delta$

b) Compute the value of definite integral **8**

$$\int_0^{\pi} \frac{\sin^2\theta}{5 + 4\cos\theta}\, d\theta$$

taking $h = \frac{\pi}{6}$ by using

i) Trapezoidal rule

ii) Simpson's $\frac{3}{8}$ rule.

OR

8. a) For the following tabulated data : **8**

x	0.0	0.5	1.0	1.5	2.0	2.5	3.0
f(x)	0.000	0.191	0.341	0.433	0.477	0.494	0.499

Use Stirling's formula to find f (1.65).

b) For the following tabulated data : **9**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.6.

9. a) Using Newton-Raphson method find a real root of the equation $x^3 + 2x - 5 = 0$ (Use five iterations). Write the algorithm for the method used. **9**

b) Use method of least squares to fit a second degree parabola of the form $y = ax^2 + bx + c$ to satisfy the data : **8**

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

OR

10. a) Solve the following system of equations by Gauss-Seidel iterative method. **8**

$20x_1 + x_2 - 2x_3 = 17$

$3x_1 + 20x_2 - x_3 = -18$

$2x_1 - 3x_2 + 20x_3 = 25$

b) Using fourth order Runge-Kutta method solve the equation $\frac{dy}{dx} = \sqrt{x+y};\ y(0) = 1$ to find y at x = 0.2 taking h = 0.1. Write the algorithm for the method used. **9**

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the fig. 11 a **8**

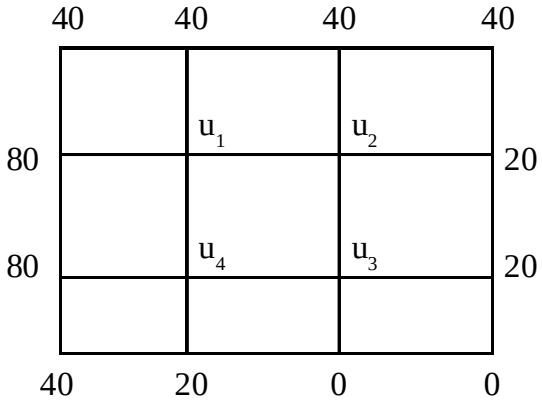

Fig. 11 a

b) Solve the following Linear programming problem by Simplex method. **8**

Minimize : $z = x_1 - 3x_2 + 3x_3$,

Subject to $3x_1 - x_2 + 2x_3 \leq 7$,

$-2x_1 - 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$,

$x_1, x_2, x_3 \geq 0$.

OR

12. a) Solve the equation $\nabla^2 u = -10\,(x^2 + y^2 + 10)$ over the square with sides x = 0 = y, x = 3 = y with u = 0 on the boundary and mesh length = 1. **8**

b) Solve the following Linear programming problem by Simplex method. **8**

Maximize : $z = 4x_1 + 3x_2 + 6x_3$,

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$,

$4x_1 + 3x_3 \leq 470$,

$2x_1 + 5x_2 \leq 430$,

$x_1, x_2, x_3 \geq 0$.

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T.E. (Petroleum) (Semester – I) Examination, 2010
PETROLEUM GEOLOGY – I
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the questions of **both** the Sections should be written **separate** answer books.*

*2) Draw **neat** diagrams **wherever** necessary.*

*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. A) What is rock cycle ? Describe with the help of a neat-labeled diagram. **6**

1. B) Explain what happens when mudstone/shale passes into slate/phyllite ? **6**

1. C) What are the rock forming minerals and accessory minerals ? **4**

OR

1. A) How to classify sedimentary rocks based on mode of occurrence ? **6**

1. B) Draw a flow chart for the processes involved in the formation of sedimentary rocks. **6**

1. C) What are different textures in igneous rocks ? **4**

2. A) What is physical and chemical weathering ? Describe any two mode of physical weathering. **8**

2. B) How to distinguish between breccia and conglomerate on the basis of texture, composition, source of sediments and origin ? **8**

OR

2. A) Discuss the triangular classification of mass movement. **8**

2. B) Describe the internal structure of the earth using the earthquake waves. **8**

P.T.O.

3. A) Describe with the help of neat sketches any one geometric classification of folds. Explain relation between wavelength and amplitude of folds with increasing or decreasing interlimb angle. **12**

3. B) Describe with neat figures the geometric classification of joints. **6**

OR

3. A) What are normal and reverse faults ? Explain the criteria to recognize these faults in bore hole. **8**

3. B) Give quantitative description of discontinuities. **6**

3. C) What is vertical thickness and true stratigraphic thickness ? **4**

SECTION – II

4. A) What are the diagenetic changes that are taking place in sedimentary rocks with increasing depth and temperature ? **8**

4. B) Discuss the classification of sedimentary rocks based on triangular diagram of lime-sand – clay/mud. **8**

OR

4. A) Explain how a textural maturity of sediments decided on the basis of clay content, sorting of grains, grain shape. Compare textural maturity of sandstone deposited as beach sediments and Aolian deposits. **8**

4. B) Discuss the Dunham's Scheme of classification of carbonate rocks. What are the major components of carbonate rocks ? **8**

5. Write short notes on **any two** : **16**

A) Marine depth zones and distribution of organisms

B) Trace fossils as an indicator of environment of deposition

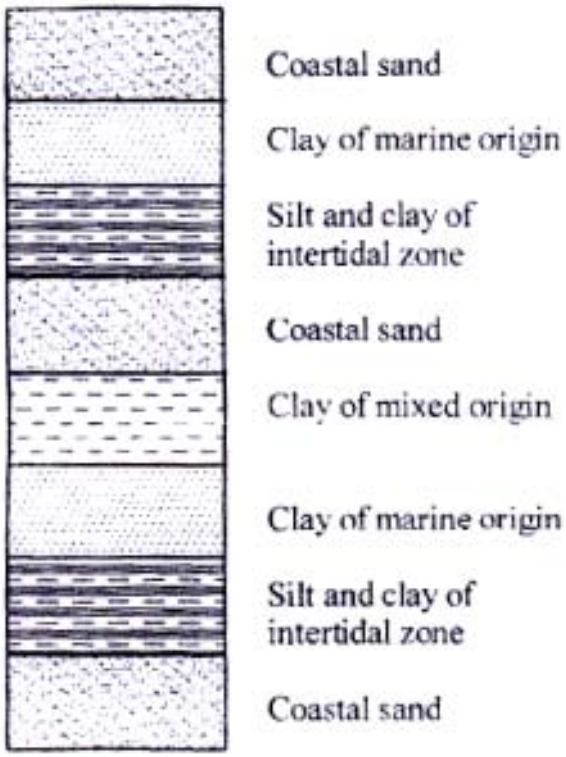
C) Use of microfossils in the exploration of hydrocarbons

D) Mode of preservation of fossils.

6. A) Write "Geological Time Scale" in a tabular form with important events. **8**

6. B) Following sedimentary sequence is encountered during preliminary subsurface investigations (Figure : 01). A break in sedimentation exists between two successive units. Reconstruct the chronology of events based on submergence and emergence of coasts.

Describe in brief the geological conditions that are responsible for the transgression, regression. **10**



OR

6. A) Discuss in brief the Petroliferous basin classification of India given by ONGC. **6**

6. B) What is an unconformity ? What are the different types of unconformities ? **6**

6. C) What is genetic increment of strata ? Draw a cross section showing relationship between environment, facies and increment of sedimentation. **6**

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T.E. (Petroleum) (Semester – I) Examination, 2010
HYDROCARBON PROPERTIES AND THERMODYNAMICS
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from **each** Section.*

*2) Answers to the **two** sections should be written in **separate** books.*

*3) Figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is **allowed.***

*5) Assume suitable data, if **necessary.***

*6) Refer to steam tables if **required.***

SECTION – I

1. a) State 1st Law of Thermodynamics and provide its mathematical expression explaining all the associated terms. **4**

   b) Explain Joule Thomson Expansion with help of neat diagram and elaborate its usefulness. **4**

   c) A rigid tank of 0.4 m^3 volume contains steam of quality 75% at pressure of 2.3 bar. Determine the amount of heat is to be added in order to have only saturated steam in the tank. What will be the final pressure in the tank ? **8**

OR

2. a) Obtain the expression of entropy change for Ideal Gas. **4**

   b) A chamber of volume 18.7 m^3 partitioned into two equal parts maintained at 576 K, 4.3 bar and 1200 K and 5.7 bar respectively. If the partitioned is removed quickly, what will be net entropy change of the system ? **6**

   c) With help of neat sketch explain the operation of Carnot Cycle and derive the equation of its efficiency. **6**

P.T.O.

3. a) Discuss the van der Waal equation of state with help of P-V diagram and elaborate its major contribution. **6**

   b) The vapor phase molar volume of an unsaturated hydrocarbon is reported to be 32,543 cm^3/mol at 325 K and 1 bar. No other data is available. Without considering ideal gas law, determine a reasonable estimate of molar volume of vapor at 400 K and 2.3 bar. **6**

   c) Define and explain following : **4**

   Compressibility factor, Acentric factor.

OR

4. a) Calculate molar volume of iso-butane at 456 K and 8 bar considering van der Waals equation of state. **8**

   Given that, the critical temperature = 408 K and critical pressure = 36.48 bar for the above mentioned hydrocarbon.

   b) Write down complete expression of any two equation of state with proper explanation of all the associated terms. **4**

   c) Explain the contribution of various thermodynamic relations with help of suitable example. **4**

5. a) Discuss the Gibbs-Duhem equation and provide its expression in different forms. In this context highlight its major field of application. **6**

   b) Develop an expression for determination of Fugacity coefficient for a van der Waal gas. Determine fugacity and fugacity coefficient for n-octane vapor at 427 K and 0.2 MPa **8**

   Given : a = 3.789 Pa $(m^3/mol)^2$ and $b = 2.37 \times 10^{-4}$ m^3/mol.

   c) Define chemical potential and activity coefficients. Provide their physical significances. **4**

OR

6. a) Derive and Discuss : **6**

   i) Clapeyron Equation.

   ii) Clausius – Clapeyron Equation.

b) Several sportsmen in cold countries like ice skating. If a sportsman of mass 68 kg goes for skating on ice at -2.5 °C with skates having 20 mm^2 area of contact with a flat surface, will he be able to skate? Data : specific volume of ice and water at 0 °C are 1.091×10^{-3} m^3/kg and 1.0×10^{-3} m^3/kg respectively. Enthalpy of melting of ice is 6.002 kJ/mol. **6**

c) The van Laar constant A and B for iso-octane and n-decane are 3.745 and 2.78 respectively at 250 °C. Calculate activity coefficient of the compounds in a solution containing 72 mol % iso-octane. **6**

SECTION – II

7. a) State Phase Rule. Discuss its thermodynamic basis. **6**

b) Assume that cold drinks contain only CO_2 (1) and H_2O (2), determine the composition of the vapor and liquid phases in a sealed can at 8 °C. Henrys constant for CO_2 in water at 8 °C is about 987 bar. **6**

c) In multi-component VLE, explain the flash calculations with help of flow chart. **6**

OR

8. The system n-pentane (1), n-hexane (2) and n-heptane (3) forms an ideal solution. If feed stream of overall composition $x_1 = 0.3, x_2 = 0.3$ and rest x_3 is continuously fed to a flash vaporizer maintained at 200 kPa and 90 °C. Determine compositions of liquid and vapor streams leaving the flash unit. Also estimate fraction of feed vaporized in the unit. **18**

	A	***B***	***C***
n-pentane	6.876	1075.780	233.205
n-hexane	6.911	1189.640	226.280
n-heptane	6.894	1264.370	216.640

Antoine equation are given by : $\log P^{vap} = A - \frac{B}{t+C}$

Where, t is in °C and P^{vap} is in Torr. (1 Torr = 133.322 Pa).

9. a) With help of neat diagram explain wetting of solid surface by liquid. In this context discuss the imbibition and drainage mechanism. **8**

   b) Write down Laplace Young Equation with proper explanation of all the terms associated in it. Highlight its application in flow through porous media. **8**

OR

10. a) With help of mathematical expressions explain effect of curvature on equilibrium of Droplet or Bubble. Discuss its physical significance. **6**

    b) What is Knudsen Diffusivity ? Why it is so important to petroleum reservoirs ? **4**

    c) Give mathematical representation of Darcy's law with proper explanation of all the associated terms. What is permeability ? Highlight heterogeneity of reservoir from permeability perspective. **6**

11. a) Draw a schematic diagram to explain typical vapor-liquid-solid solution model for wax precipitation in petroleum mixture. Explain the process physically as well as with help of relevant mathematical expressions. **6**

    b) Name all the gases which can produce gas hydrates. **4**

    c) 1 m^3 of methane gas hydrate contain almost 670 m^3 of methane gas at STP and 1 m^3 of water. From this information calculate the density of the gas-hydrate. **6**

OR

12. a) With help of phase diagram explain the formation of Gas Hydrates. **6**

    b) With help of neat sketch explain the precipitation of asphaltenes from bulk crude in presence of resin compounds. **6**

    c) Gas hydrates may cause land slides and even sunami – Elaborate and discuss at depth. **4**

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T.E. (Petroleum) (Semester – I) Examination, 2010
PETROLEUM PRODUCTION OPERATIONS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer Q. No.* ***1*** *or* ***2****, Q. No.* ***3*** *or* ***4****, Q. No.* ***5*** *or* ***6*** *from Section-**I** and Q. No.* ***7*** *or* ***8****, Q. No.* ***9*** *or* ***10****, Q. No.* ***11*** *or* ***12*** *from Section-**II**.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, calculator is* ***allowed****.*

6) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) What is Christmas tree ? Why it is necessary ? Draw the neat schematic sketch of a typical Christmas tree and discuss various components with their functions in brief. **9**

   b) What is a surface choke ? Write the functions and objectives of its use and explain, how it helps to mount back pressure in the line and on the reservoir formation ? **9**

OR

2. a) What is Wellhead equipment ? What is the purpose of it ? Draw the neat schematic sketch of a typical Wellhead equipment and discuss various components with their functions in brief. **9**

   b) Write in brief the procedure to open the well to allow it flow through the Christmas tree. Explain the role of a surface and sub surface safety valve during various flow control operations. **9**

P.T.O.

3. a) List the various types of bottom hole production equipments and explain their functions in brief. **8**

   b) Draw the typical schematic sketch of a producing well and indicate entire sub-surface producing section along with various tools, packer, casing-tubing arrangement and other features. **8**

OR

4. a) Illustrate the effect of pressure and temperature on production tubing length changes and various forces acting on it. **6**

   b) What is packer ? Write the functions of a packer. Draw the neat schematic sketch and explain the general packer setting mechanism and its components in brief. **10**

5. A well is drilled from a payzone at 6500 to 6800 ft. The well has a static pressure of 2400 psi and P.I. of 0.375 STB/day/psi and produces with GLR of 400 cuft/bbl. Tubing sizes available are 2.375", 2.875" and 3.5". Select the optimum tubing size, which can run near the upper boundary of payzone, if it is to be operated at THP of 250 psi. (Refer the Gilbert chart : figures on page **5** to **8**). **16**

OR

6. a) Define the following parameters : **6**

   i) Productivity Index

   ii) Specific Gravity of oil

   iii) Bubble-point pressure.

   b) It was desired that, well having a P.I. of 0.5 bbl / (day) (psi) and a SBHP of 2050 psi will flow at a rate of 400 bbl/day. Well is completed with $2\frac{3}{8}$ tubing at 4000 ft. The GLR is 0.3 mcf/bbl. **5**

   Will the well flow as per expectation ?

   (Refer the Gilbert chart : Figures on page **5** to **8**)

c) What is the THP of a well completed with 8000 ft., of 2 3/8 inch tubing, that is flowing at 600 bbl/day and a G.L.R. of 0.3 mcf/bbl if the pressure at the bottom of tubing is 2000 psi ? (Refer figure no. **1**) **5**

SECTION – II

7. a) Draw the neat schematic sketch and describe the two important methods of well perforation along with their applications in detail. **9**

b) Draw the neat schematic sketch and explain multiplezone well completion method with merits, demerits to produce three sands using two tubing's and two packers. **9**

OR

8. a) Explain well activation and well circulation in brief. **4**

b) Discuss the following along with typical graph in brief : **14**

i) drill stem testing

ii) repeat formation testing.

9. a) Construct IPR of a well in a saturated oil reservoir using both Vogel's equation and Fetkovich's equation. Following data is available. **10**

Reservoir pressure = 3,000 psia

Tested flowing bottom-hole pressure, pwf - 1 = 2,000 psia

Tested production rate at pwf - 1 = 500 stb/day.

Tested flowing bottom-hole pressure, pwf - 2 = 1,000 psia

Tested production rate at pwf - 2 = 800 stb/day.

Assume n = 1 and c = 0.0001 stb/day-psi^{2n}.

b) Draw the generic nature of graph to indicate the trend of GOR, PI and pressure against time in a typical reservoir having solution gas drive and bottom water drive mechanism. **6**

OR

10. a) Draw the schematic sketch and explain various flow regimes in the sequence of their occurrence for flow through vertical production tubing from solution gas drive reservoir. **8**

    b) For a test at bubble point pressure the following data is reported.

    Calculate : Maximum flow rate using Vogel's IPR,

    Oil flow rate at bottom hole pressure flowing pressure = 600 psia.

    And Generate Vogel's IPR.

    Data given : Reservoir pressure = 2500 psi

    Bubble point pressure = 2500 psi. Flowing bottom hole pressure is, 1100 psi at test flow rate = 550 bbls/day. **8**

11. a) Classify different workover operations according to formation related problems and mechanical problems of a well. How they are responsible for decline in oil/gas production from a well ? Explain the remedial measures for any four problems in brief. **8**

    b) What is water and gas coning ? Why it takes place ? How squeeze cementation is useful in gas and water shut-off job ? Describe the steps for gas and water shut-off job in brief. **8**

OR

12. a) Write in brief short notes on **any two** of the following : **10**

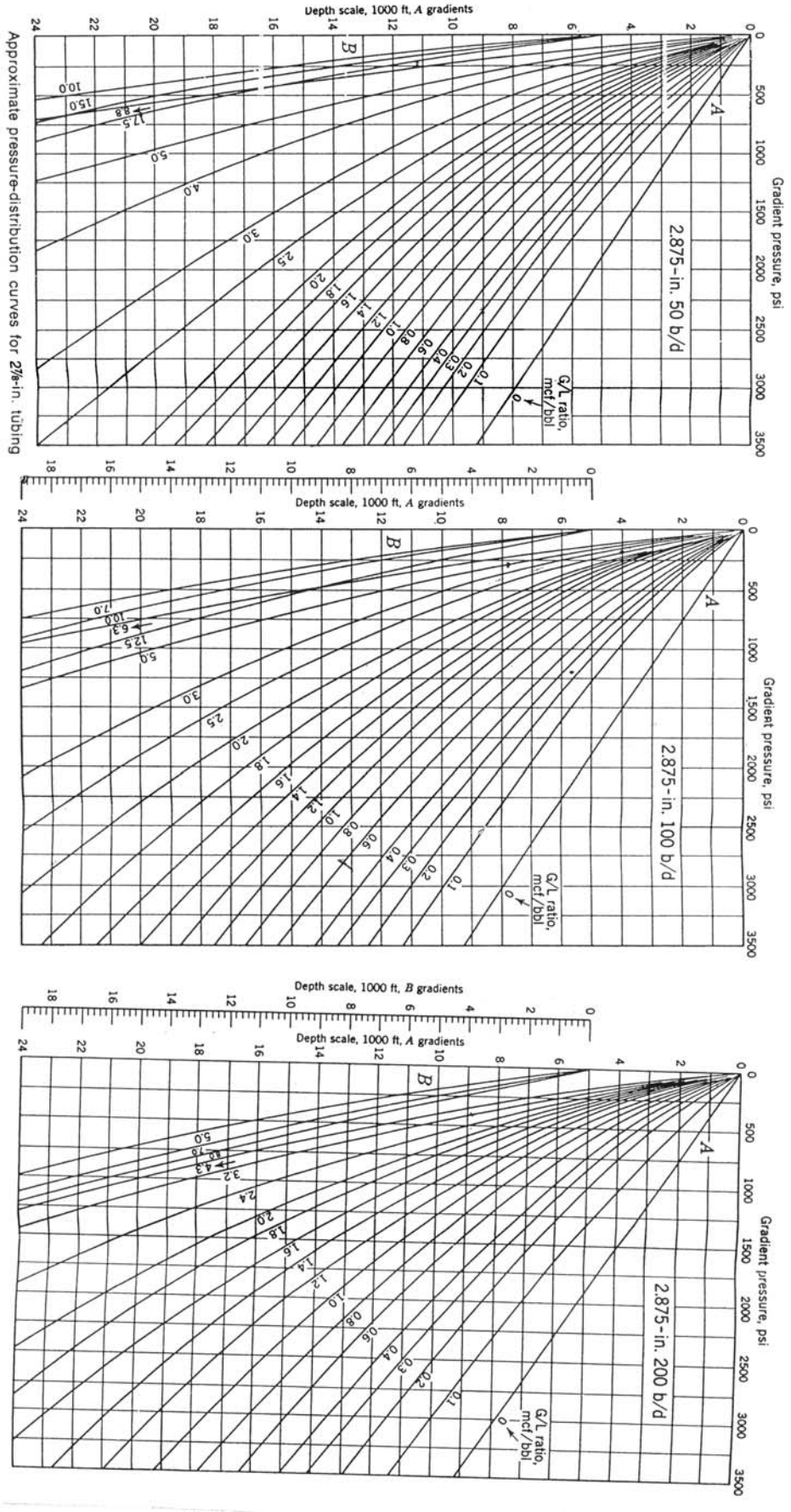
    i) gravel packed well completion

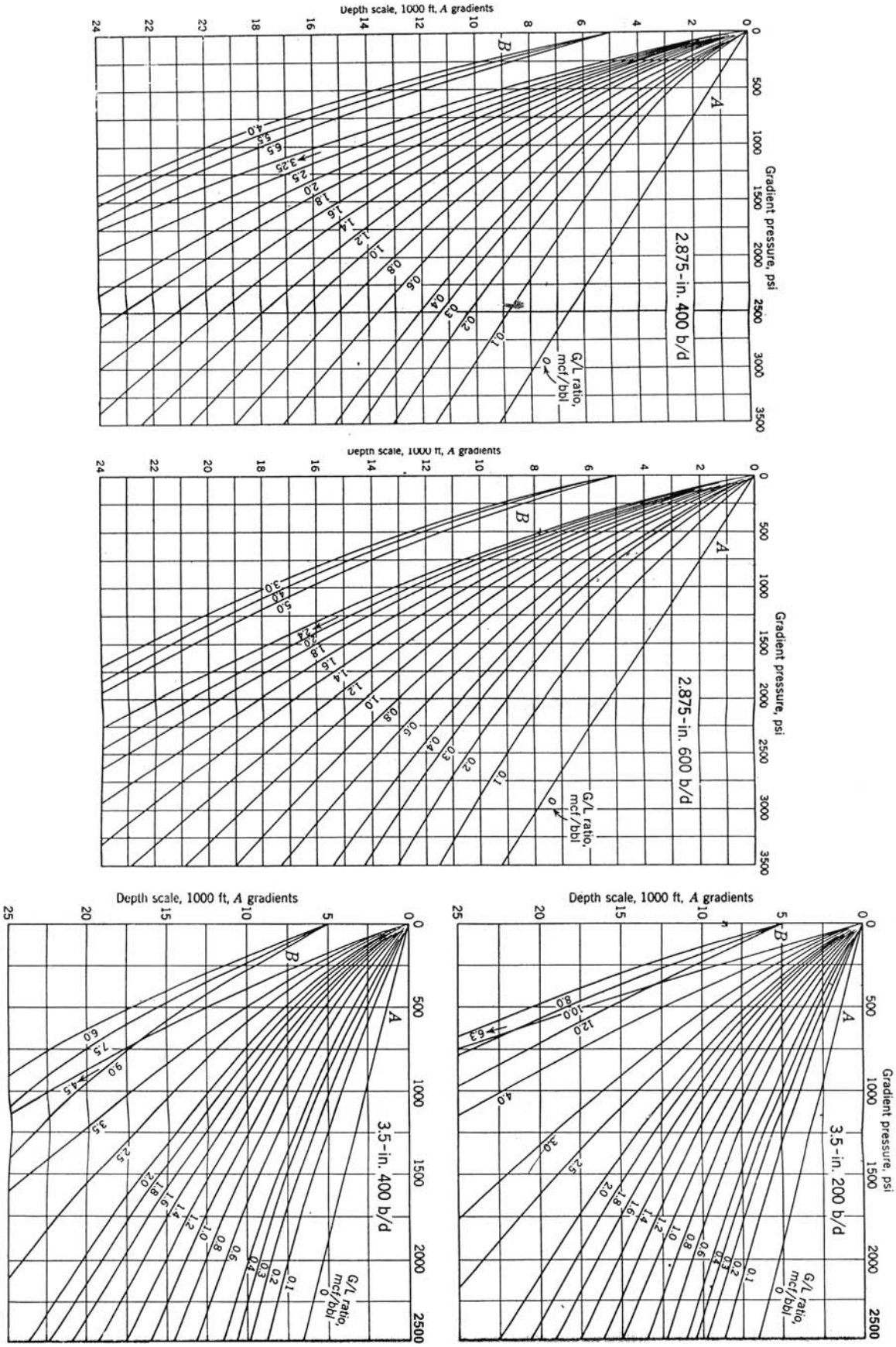
    ii) drainage area calculations for horizontal wells

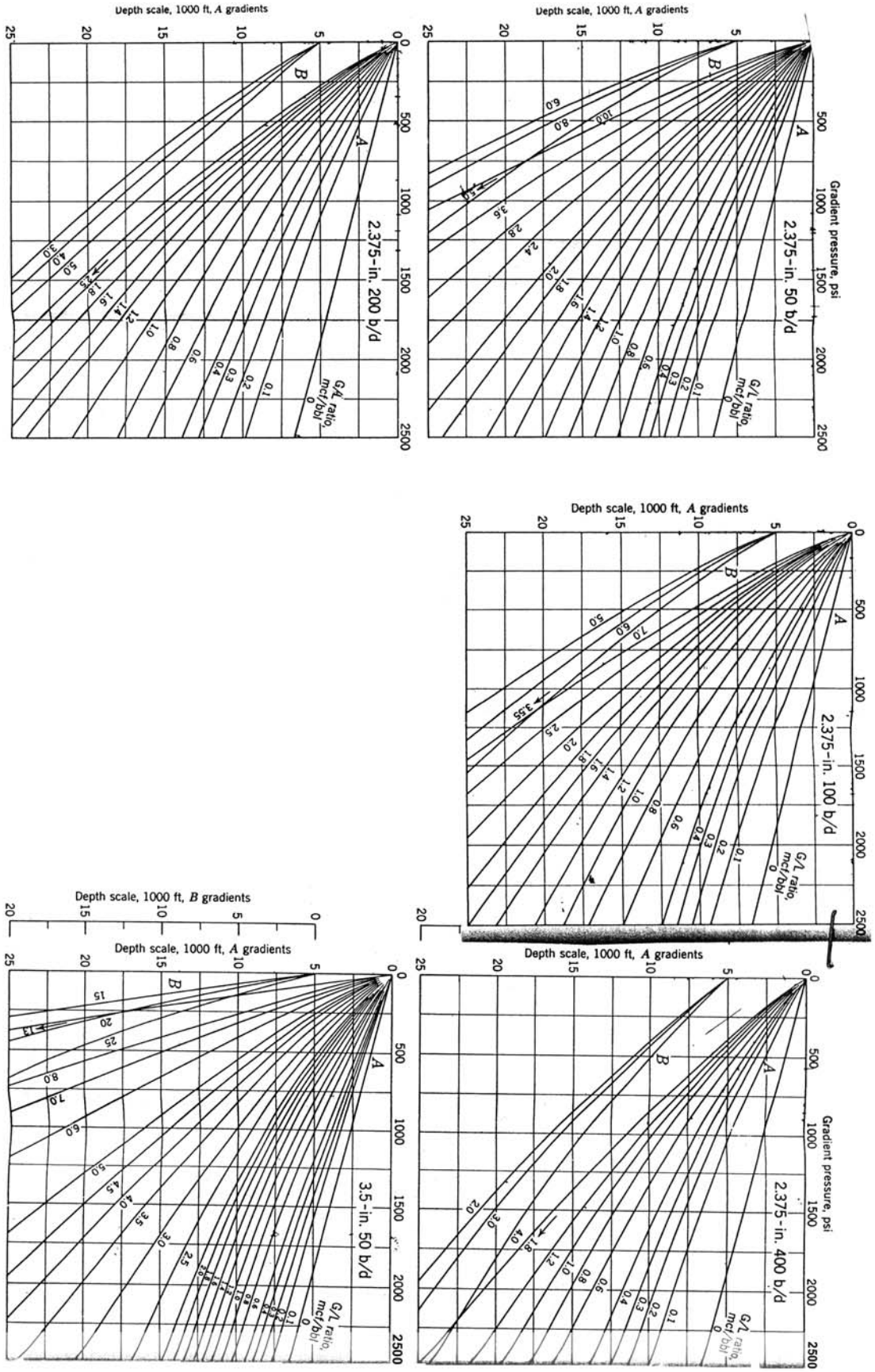
    iii) intelligent well completion

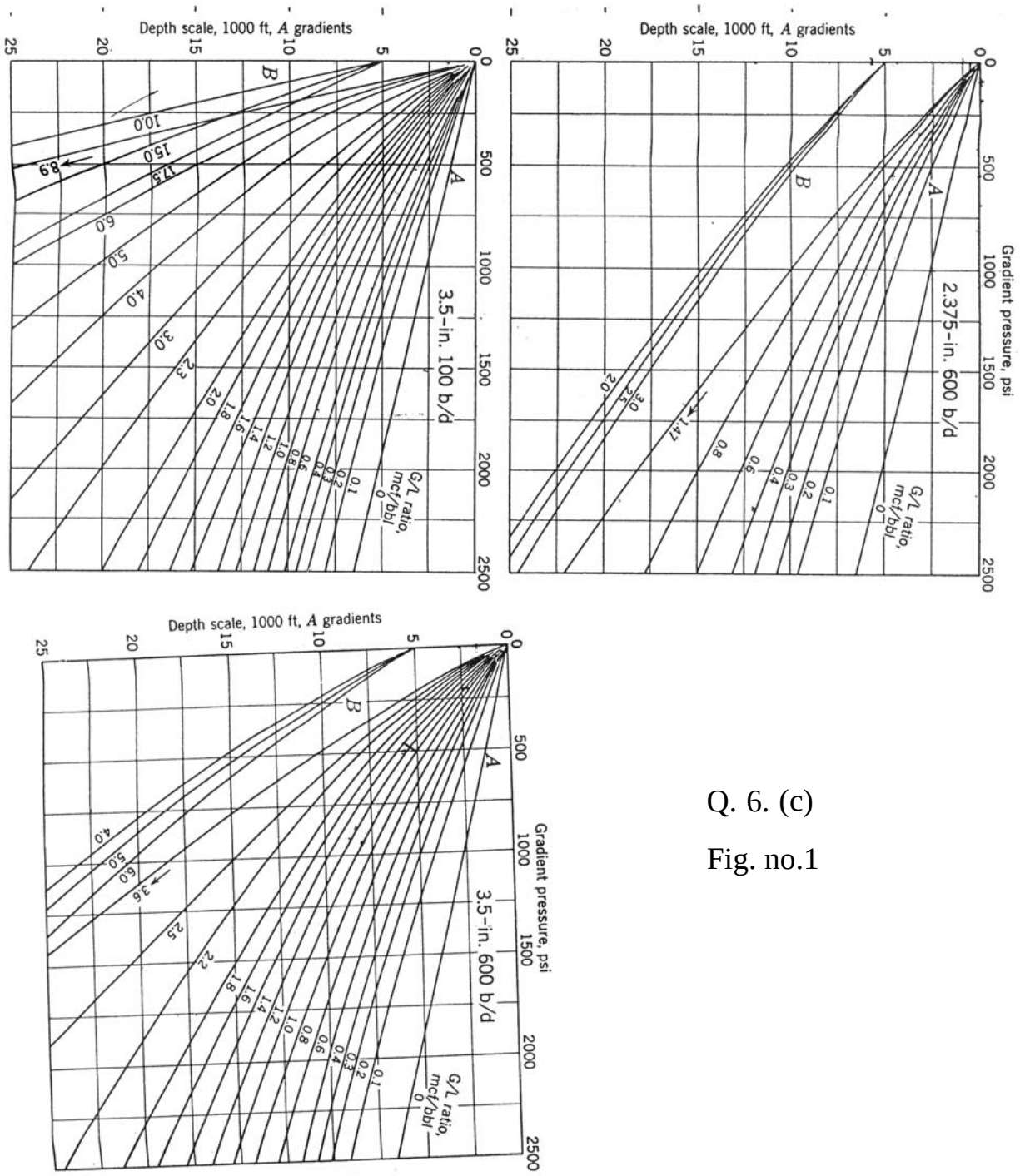
    iv) skin damage and pressure drop.

    b) Use the equation of state and derive the formula of gas formation volume factor. Also estimate the value of gas formation volume factor for 0.818 gravity dry gas in a reservoir with temperature 220 °F and reservoir pressure of 2100 psig. Assume gas compressibility factor, Z = 0.855. **6**


Approximate pressure-distribution curves for 2⅞-in. tubing
Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.875-in. 50 b/d
G/L ratio, mcf/bbl
Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.875-in. 100 b/d
G/L ratio, mcf/bbl
Depth scale, 1000 ft, B gradients
Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.875-in. 200 b/d
G/L ratio, mcf/bbl


Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.875-in. 400 b/d
G/L ratio, mcf/bbl
Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.875-in. 600 b/d
G/L ratio, mcf/bbl
Depth scale, 1000 ft, A gradients
Gradient pressure, psi
3.5-in. 200 b/d
G/L ratio, mcf/bbl
Depth scale, 1000 ft, A gradients
3.5-in. 400 b/d
G/L ratio, mcf/bbl


Depth scale, 1000 ft, A gradients
Gradient pressure, psi
2.375-in. 50 b/d
2.375-in. 200 b/d
2.375-in. 100 b/d
2.375-in. 400 b/d
3.5-in. 50 b/d
Depth scale, 1000 ft, B gradients
G/L ratio, mcf/bbl



Q. 6. (c)

Fig. no.1

B/II/10/250

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T.E. (Petrochemical) (Semester – I) Examination, 2010
NUMERICAL AND STATISTICAL METHODS (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

Instructions *: 1) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*

2) In Section ***I****, attempt Q. No.* ***1*** *or Q.No.****2****, Q.No.****3*** *or Q.No.****4****. Q.No.****5*** *or Q.No.****6****. In Section* ***II****, attempt Q.No.****7*** *or Q.No.****8****, Q.No.****9*** *or Q.No.****10****, Q.No.****11*** *or Q.No.****12****.*

3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

4) Figures to the ***right*** *indicate* ***full*** *marks.*

5) ***Use*** *of non-programmable electronic pocket calculator is* ***allowed****.*

6) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Find all basic feasible solutions for the system of equations : **6**

$4x_1 + 3x_2 - 2x_3 = 3$

$2x_1 + 5x_2 + 4x_3 = 5$

Which of the solutions are

i) non-degenerate

ii) degenerate ?

b) Solve the following LP problem : **10**

Maximize : $Z = 3x_1 + 2x_2 + 5x_3$

Subject to the constraints

$x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

OR

2. a) Explain the concept of duality in a Linear Programming Problem. Write the dual of the following LPP.

Maximize : $Z = 2x_1 + 5x_2 + 6x_3$

Subject to the constraints :

$5x_1 + 6x_2 - x_3 \leq 3$,

$-2x_1 + x_2 + 4x_3 \geq 5$

$x_1 - 5x_2 + 3x_3 \leq 1$

$-3x_1 - 3x_2 + 7x_3 \leq 6$,

$x_1, x_2, x_3 \geq 0$ **6**

b) Solve the following LPP problem :

Minimize : $Z = 2x_1 + x_2 + x_3$,

Subject to the constraints : **10**

$2x_1 + 2x_2 + 4x_3 \geq 20$,

$4x_1 + 2x_2 + 2x_3 \geq 15$,

$x_1, x_2, x_3 \geq 0$

3. a) Solve the following cost minimizing Assignment problem. Find also the minimum cost.

		Jobs				
		I	II	III	IV	V
Machines	A	11	10	18	5	9
	B	14	13	12	19	6
	C	5	3	4	2	4
	D	15	18	17	9	12
	E	10	11	19	6	14

6

b) Find the optimal solution to the transportation problem, applying Vogel's Approximation Method (VAM)

Destination

		D_1	D_2	D_3	D_4	Supply
Source	S_1	8	9	6	3	18
	S_2	6	11	5	10	20
	S_3	3	8	7	9	18
Demand		15	16	12	13	

10

OR

4. a) A company has four machines on which three jobs have to be done. Each job can be assigned to only one machine. The cost of each job on each machine is given in the following table : **6**

Machines

		P	Q	R	S
Jobs	**A**	18	24	28	32
	B	8	13	17	19
	C	10	15	19	22

Find the optimal assignment which will minimize the cost.

b) Solve the following transportation problem, using Vogel's Approximation method.

To

		A	B	C	D	Supply
From	**X**	21	32	32	12	7
	Y	72	32	42	62	9
	Z	42	10	72	22	18
Demand		5	8	7	14	

10

5. a) The following table shows the age (X) and blood pressure (Y) of 8 persons.

X :	52	63	45	36	72	65	47	25
Y :	62	53	51	25	79	43	60	33

8

Find the correlation coefficient. Find also the regression equation of Y on X. Hence find the blood pressure of a person whose age is 60.

b) Assuming that the probability, that any one of 8 telephone lines is engaged, at any instant, is $\frac{1}{4}$, find the probability that i) atleast one of the lines is engaged, ii) all lines are engaged. **4**

c) Fit a Poisson distribution to the following data :

No. of defects	:	0	1	2	3	4	5
Frequency	:	6	13	13	8	4	3

6

Comparing the theoretical frequencies with the actual frequencies, comment on the goodness of fit.

OR

6. a) In a partially destroyed laboratory record, only the equations giving the two lines of regression of Yon X and X on Y are given respectively $7X - 16Y + 9 = 0$, $5Y - 4X - 3 = 0$. Calculate $\overline{X}$, $\overline{Y}$ and r. **6**

b) In an examination taken by 500 candidates, the average marks are 40% and standard deviation is 10%. Assuming that the marks are normally distributed, find approximately,

i) How many will pass if 50% is fixed as minimum for passing ? **6**

ii) What should be the minimum if 350 candidates are to pass ?

[Given : Area under the standard Normal curve :

Between $z = -\infty$ to $z = 1$ is 0.8413,

$z = -\infty$ to $z = 0.52$ is 0.6985

$z = -\infty$ to $z = 0.53$ is 0.7019]

c) Records of the number of male and female births in 800 families, having four children are as follows :

No. of male births :	0	1	2	3	4
No. of female births :	4	3	2	1	0
No. of families :	32	178	290	236	94

Test whether the data are consistent with the hypothesis that the binomial law holds, i.e. the chance of male birth is equal to that of female birth.

Apply χ^2 test. [Given : $\chi^2_{4,\ 0.05}$ = 9.49]. **6**

SECTION – II

7. a) With usual notations establish the following : **9**

i) $(E + 1)\delta = 2(E - 1)\mu$

ii) $\mu^2 = 1 + \frac{\delta^2}{4}$

iii) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$

b) Compute the value of definite integral **8**

$$\int_{0.2}^{1.4} (\sin x - \log_e x + e^x)\, dx$$

taking h = 0.2 by using

i) Simpsons's $\frac{1}{3}$ rule ii) Simpsons's $\frac{3}{8}$ rule

and compare the result with true value.

OR

8. a) Using Stirling's formula find u_{11} given that $u_2 = 21.857$, $u_6 = 21.025$, $u_{10} = 20.132$, $u_{14} = 19.145$, $u_{18} = 18.057$. **8**

   b) Find the polynomial passing through points (0, 1), (1, 1), (2, 7), (3, 25), (4, 61), (5, 121) using Newton's interpolation formula and hence find y and $\frac{dy}{dx}$ at x = 0.5. **9**

9. a) Using Newton-Raphson method obtain the positive real root of $x \log_{10} x = 1.2$ correct to four places of decimal. **8**

   b) Solve the following system of equations by Gauss elimination method.

   $10x - 7y + 3z + 5u = 6$ **8**

   $-6x + 8y - z - 4u = 5$

   $3x + y + 4z + 11u = 2$

   $5x - 9y - 2z + 4u = 7$

OR

10. a) Solve the following system of equations by Gauss -Seidel method **8**

   $27x_1 + 6x_2 - x_3 = 85$

   $6x_1 + 15x_2 + 2x_3 = 72$

   $x_1 + x_2 + 54x_3 = 110$

   b) Use method of least squares to fit a second degree parabola of the form $y = ax^2 + bx + c$ to satisfy the following data. **8**

x	1	2	3	4	5	6	7
y	–5	–2	5	16	31	50	73

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ over the square region $0 \leq x \leq 4; 0 \leq y \leq 4$ by dividing it into 16 subsquares of side 1 unit. Given that : u (0, y) = 0; u(4, y) = 12+y; u(x, 0) = 3x; u(x, 4) = x^2. **9**

b) Using Modified-Euler's method solve the equation $\frac{dy}{dx}=\log_e(x+y); y(1)=2$ to find y at x = 1.2 and 1.4 taking h = 0.2. **8**

OR

12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=-500$ for pivotal values on square plate bounded by x = 0 = y, x = 3 = y and u = 0 at the every point on the boundary of square plate and mesh length = 1. **9**

b) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$; y(0) = 1 to find y at x = 0.4 taking h = 0.2. **8**

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T.E. (Petrochemical) (Sem. – I) Examination, 2010
MASS TRANSFER – I (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer any **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. Answer the following questions in brief (**any four**) : **18**

a) What equation would you use to estimate the diffusivity of O_2 in liquid water at 25°C ? Which of the necessary constants do you know (can you calculate) ? What are their values ? You do not need to solve the equation.

b) Explain molecular and eddy diffusion by giving suitable examples.

c) Describe in brief method to estimate the diffusivity of a volatile solvent into air.

d) Give the correlations for estimation of diffusivity in gases and explain the terms involved in it.

e) Draw a graph showing concentration gradient for equimolar diffusion.

f) The value of diffusion coefficient for a dilute solution of methanol in water at 288 K is given by $1.28 \times 10^{-5} \frac{cm^2}{s}$. Estimate diffusion coefficient for same solution for 373K, using Wilke-Chang correlation.

OR

2. a) A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates, the level drops slowly. At a given time t, this level in the tube is Z from the top. Derive an expression to calculate the value of diffusivity of liquid Vapour in the gas. **9**

   b) Water in the bottom of a narrow metal tube is held at a constant temperature of 293 K. The total pressure of air (assumed dry) is 1.01325 × 105 Pa and the temperature is 293 K Water evaporates and diffuses through air in the tube, and the diffusion path is 0.1524 m long. Calculate the steady-state rate of evaporation in k mole/m^2.s. The diffusivity of water Vapour at 293 K and 1 atm pressure is 0.25×10^{-4} m^2/s. Assume the system is isothermal. Vapour pressure of water at 20°C = 17.54 mm Hg. **9**

3. a) The solute HCl (A) is diffusing through a thin film of water (B) 2.0 mm thick at 283 K. The concentration of HCl at point 1 at one boundary of the film is 12.0 wt% HCl (density ρ_1 = 1060.7 kg/m^3), and at the other boundary of the film at point 2 it is 6.0 wt% HCl (density ρ_2 = 1030.3 kg/m^3). The diffusion coefficient of HCl in water is 2.5×10^{-9} m^2/s. Assuming steady state and one boundary impermeable to water, calculate the flux of HCl. **8**

   b) A flat plug 30 mm thick having an area of 4.0×10^{-4} m^2 and made of vulcanized rubber is used for closing an opening in a container. The gas CO_2, at 25°C and 2.0 atm pressure is inside the container. Calculate the total leakage of CO_2 through the plug to the outside in kg mol CO_2/s at steady state. Assume that the partial pressure of CO_2 outside the container is zero.

   Data :

   For CO_2 in vulcanized rubber S = 0.90 $m^3{}_{STP}/m^3$. atm, and

   $D_{CO2} = 0.11 \times 10^{-9}$ m^2/s,

   You may used following expression : **8**

$$N_A = -\frac{P_M \Delta P_A}{22.4 \Delta z}$$, Where P_M is the permeability of gas A in the solid.

OR

4. a) Due to valve leakage, water has spilled on the floor on an industrial complex. Determine the period the water will take to evaporate out in the adjacent stagnant air of the surroundings.

Data :

The water layer = 1.25 mm thick

The temperature of water = 297 K

The surrounding air temperature = 297 K

The surrounding air pressure = 1 std. atm.

Absolute humidity of air = 2×10^{-3} kg of water/kg of dry air.

Assume steady-state molecular diffusion taking place through a still air film 5 mm thick during evaporation process.

You can take diffusivity of water in air = 2.6×10^{-5} m^2/s at 298 K and 1 std. atm. **8**

b) Explain in brief the theories of mass transfer by giving their salient features. **8**

5. a) By what % would the rate of absorption be increased or decreased by increasing the total pressure from 100 – 200 kN/m^2 in the following cases :

i) The absorption of NH_3 from a mixture of NH_3 and air containing 15% NH_3 by volume using pure water as a solvent. Assume that other resistance to mass transfer lies within the gas phase.

ii) The same condition as (a) but the absorbing solution exerts a partial Vapour pressure of NH_3 of 10 kN/m^2.

The diffusivity can be assumed to be inversely proportional to absolute temperature. **10**

b) A bubble of O_2 originally 0.15 cm in diameter is injected into excess stirred after 9 minutes, the bubble is 0.059 cm in diameter. What is the mass transfer coefficient ? **6**

OR

6. a) Develop material balance equations for steady state counter current mass transfer operations. Show the graphical representation on x-y diagram. **8**

   b) A gas mixture, A – Air is fed into an absorption tower where absorption of the component A in water is taking place at 288 K and 3 std. atm. pressure.

   Given : $K_1 = 0.152 \frac{\text{k mole A}}{(\text{hr.m}^2)\,(\text{mole A}/\text{m}^3)}$

   $$K_g = 1.22 \frac{\text{k mole A}}{\text{hr.m}^2\text{.atm.}}$$

   The equilibrium partial pressure of the gas A over dilute solution of A in water is given by $P_A, i = 0.25\ C_A, i$

   where, $P_{A,\,i}$ is the atm., $C_{A,\,i}$ is in mole A/m^3

   Determine the values of the following mass transfer coefficients : **8**

   i) Ky, ii) K_C for gas film, iii) K_G, iv) K_L.

SECTION – II

7. a) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)^{1/4}\left(\frac{c_p\mu}{k}\right)^{1/3} \quad \text{for } Gr^{1/4}Pr^{1/3} < 200$$

   Where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145°C and 1 atm.

   Explain the analogy between Nu = Sh, Sc = Pr, Gr = Gr_{AB}.

   Data :

   $P^{vap}_{naphthalene}$ = 0.19 atm, $D_{AB} = 5.81 \times 10^{-6}$ m^2/s, $d = 9.5 \times 10^{-2}$ m

   $\rho_{air} = 0.849\ \text{kg}/\text{m}^3$, $\mu_{air} = 2.15 \times 10^{-5}\ \text{kg}/\text{m.s}$. **9**

b) A stream of air at 100-kPa pressure and 300 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.2 m with a velocity of 15 m/sec. The other data are given below :

Mass diffusivity of naphthalene Vapour in air = 6×10^{-6} m^2/sec

Kinematic viscosity of air = 1.5×10^{-5} m 2.sc

Concentration of naphthalene at the air-solid naphthalene interface

= 1×10^{-5} k mole/m^3

Calculate :

i) The average mass transfer coefficient over the flat plate.

ii) The rate of loss of naphthalene from the surface per unit width.

Note : For heat transfer over a flat plate, convective heat transfer coefficient for laminar flow can be calculated by the equation.

$Nu = 0.664\ Re^{1/2}\ Pr^{1/3}$

You may use analogy between mass and heat transfer. **9**

OR

8. a) Calculate the value of Mass transfer coefficient and flux of mass transfer from a sphere of naphthalene to air at 45°C and 1 atm flowing at velocity of 0.45 m/s. The diameter of sphere is 25.4 mm. The diffusivity of naphthalene in air at 45°C is 6.92×10^{-6} m^2/s and vapor pressure of solid naphthalene is 0.75 mm of mercury.

Data : $\mu = 1.95 \times 10^{-5}$ Pa.s, $\rho = 1.114$ kg/m^3

You may use the following correlation :

$Sh = 2 + 0.552Re^{0.53} + Sc^{0.33}$, where, $Sh = K'_c \frac{dp}{D_{AB}}$. **8**

b) Calculate the maximum possible rate of O_2 uptake 310K of micro-organisms having diameter of $\frac{2}{3}$ μm suspended in an agitated aqueous solution. It is assumed that the surrounding liquid is saturated with O_2 from air at 1 atm. pressure. It will be assumed that the microorganism can utilize the oxygen much faster than it can diffuse to it.

The micro-organism has density very close to that of water.

Physical data :

1) The solubility of O_2 from air in water at 310K = 2.26×10^{-7} $\frac{\text{g mol } O_2}{\text{cm}^3 \text{ liquid}}$
2) The diffusivity of O_2 in water at 310K = 3.25×10^{-9} m^2/sec.
3) Viscosity of water at 37°C = 6.94×10^{-4} kg/ms
4) Density of water = 994 kg/m^3
5) Density of Air = 1.13 kg/m^3

(Hint : Since O_2 is consumed faster than, it is supplied, the concentration C_{A2} at the surface is zero. The concentration CA1 in the solution is at saturation.) **10**

9. a) In a laboratory drying test with a solid material the following relation for the falling rate period was obtained, $\frac{dX}{dt} = -0.8(X - 0.05)$ where X is the moisture content on dry basis of t is the time in hours. The critical moisture content is 1.5 kg moisture per kg of dry material.

Calculate the following :

i) the time required for drying the material from $X_1 = 4.0$ to $X_2 = 0.15$
ii) the equilibrium moisture content. **6**

b) Discuss in brief various types of industrial dryers and explain working principles of any one of dryer with neat sketch. **10**

OR

10. A slab with wet weight of 5 kg originally contains 50% moisture (wet basis). The slab is 600 × 900 × 75 mm thick. The equilibrium moisture content is 5% of the total weight when in contact with air of 20°C and 20% humidity. The drying rate is given below for contact with air of the above quality at a definite velocity. Drying is from one face only. How long will it take to dry the slab to 15% moisture content (wet basis) ?

Wet slab kg	9.1	7.2	5.3	4.2	3.3	2.8	2.5
Drying rate $\frac{kg}{hr.m^2}$	4.9	4.9	4.4	3.9	3.4	2.0	1.0

16

11. Write short notes on (**any three**) : **16**
    i) Concept of Equilibrium in Interphase mass transfer
    ii) Types of packings and their characteristics
    iii) Comparison of Packed towers and Tray towers
    iv) Wetted wall tower: working principles and industrial applications
    v) Types of moisture contents in solid.

OR

12. a) Classify the equipments for Humidification and Dehumidification operations. Explain the different types of cooling towers used in process industries. **10**

    b) Define all the humidity terms you know. **6**

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T.E. (Petrochemical) (Semester – I) Examination, 2010
INSTRUMENTATION AND INSTRUMENTAL ANALYSIS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from **each** Section.*

*2) Answers to the **two** sections should be written in **separate** books.*

*3) Figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator is **allowed.***

*5) Assume Suitable data, if **necessary**.*

SECTION – I

1. a) Define the following basic instrument characteristics with example : **12**

   1. Accuracy 2. Error 3. Repeatability 4. Resolution
   5. Sensitivity 6. Range 7. Hysteresis 8. Lag.

   b) Explain the working of a typical Feedback control system with suitable example. **6**

OR

2. a) What do you mean by calibration ? Explain the calibration chain. **6**

   b) Draw the Physical diagram of a process control loop and its corresponding block diagram. Explain the Role of each element. **10**

   c) Define Random errors and systematic errors. **2**

3. a) Write a short note on Temperature scales. **5**

   b) State various material properties utilized for temperature measurements. Give example of each. **5**

   c) Explain any one method of Vacuum pressure measurement. **6**

OR

P.T.O.

4. a) Give the Classification of pressure measurement techniques. Explain any one in detail with neat diagram and give its applications, advantages and disadvantages. **10**

   b) State various level measurement techniques. Explain any one in detail which can be used for process control application. **6**

5. a) State various valves used in process industries. Explain the working of any one in detail. **8**

   b) Explain with neat diagram the working of vortex shedding flowmeters. **8**

OR

6. a) In a vertical Pipe, conveying oil of specific gravity of 0.8, two pressure gauges have been installed at section 1 having diameter 16 cm and section 2 with diameter 8 cm respectively. Section 1 is 250 mm above section 2. Pressure at section 1 is greater then section 2 by 0.981 N/cm^2. Calculate the flow rate. **6**

   b) Define classification of control valve characteristics. Draw valve characteristics curves. Explain the significance of control valve characteristics in process control applications. **10**

SECTION – II

7. a) Give classification of crude oil and explain crude oil assay. **8**

   b) Explain the elemental analysis of petroleum feedstock. **8**

OR

8. a) What is spectroscopy? State different spectroscopic techniques used for analysis of fuels. **4**

   b) Define flash point and explain ASTM method to determine flash point. **8**

   c) Define the following wrt chromatographic analysis : **4**

   1) Chromatogram
   2) Retentio n time
   3) Resolution
   4) Gradient elution

9. a) Explain the steps to Interprete IR spectra of an organic compound. **8**

   b) State various methods of X-ray analysis. Explain the Electro beam probe microanalysis. **8**

OR

10. a) Determine the Spectroscopic method and identify the hydrocarbon compound with proper justification. **16**

    * * Refer to the Spectra given on last page of the question paper.

11. a) State various constituents of lubricants. Discuss additives in lubricating oils in detail. **8**

    b) Discuss the need for elemental analysis in lubricants. **4**

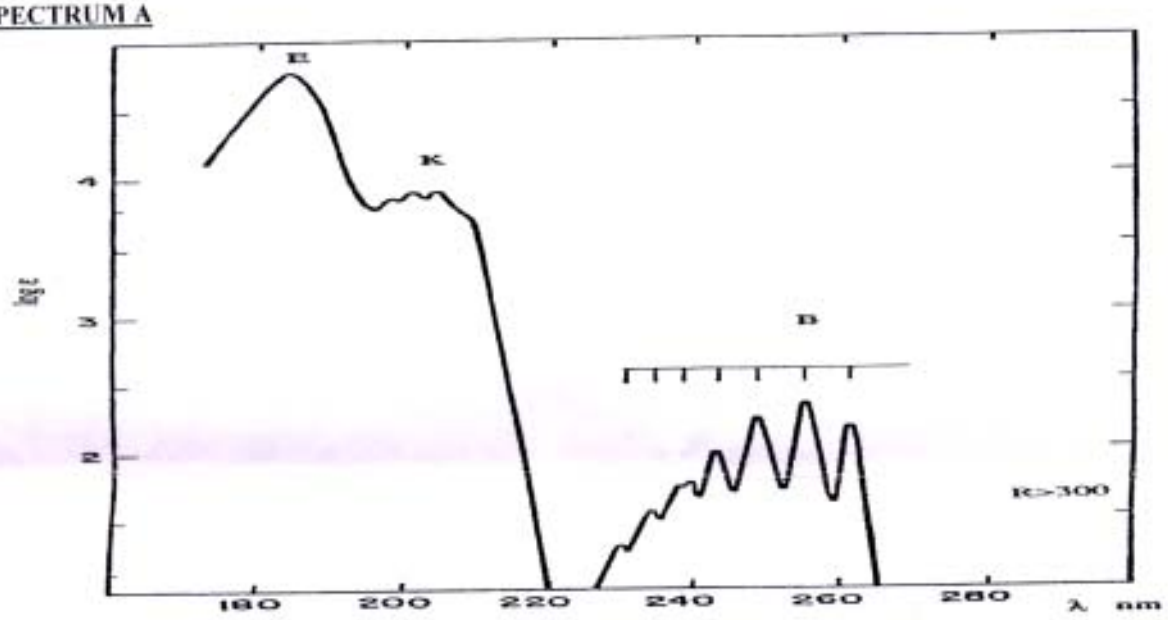
    c) Explain the characterization of lubricants by Analytical Techniques. **6**

OR

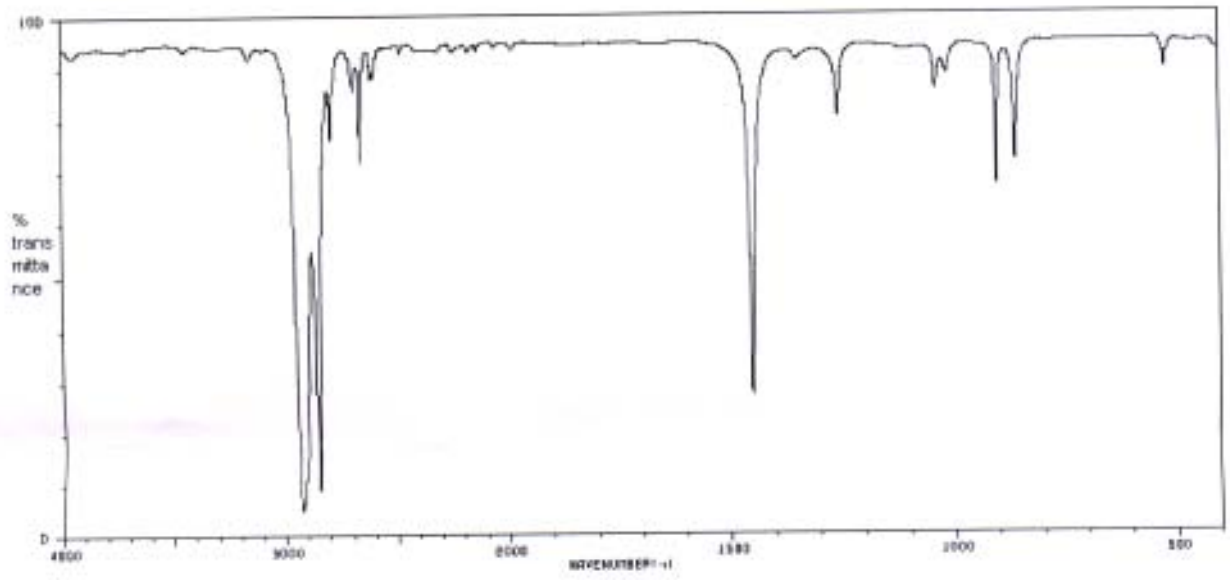
12. Write a short note on **any 3** of the following : **18**
    1) Quality Control in Refinery operations
    2) Atomic absorption spectroscopy
    3) HPLC
    4) Orsat analysis
    5) pH measurement
    6) Refractrometer

10. DETERMINATION OF SPECTROSCOPIC METHOD AND IDENTIFICATION OF COMPOUND

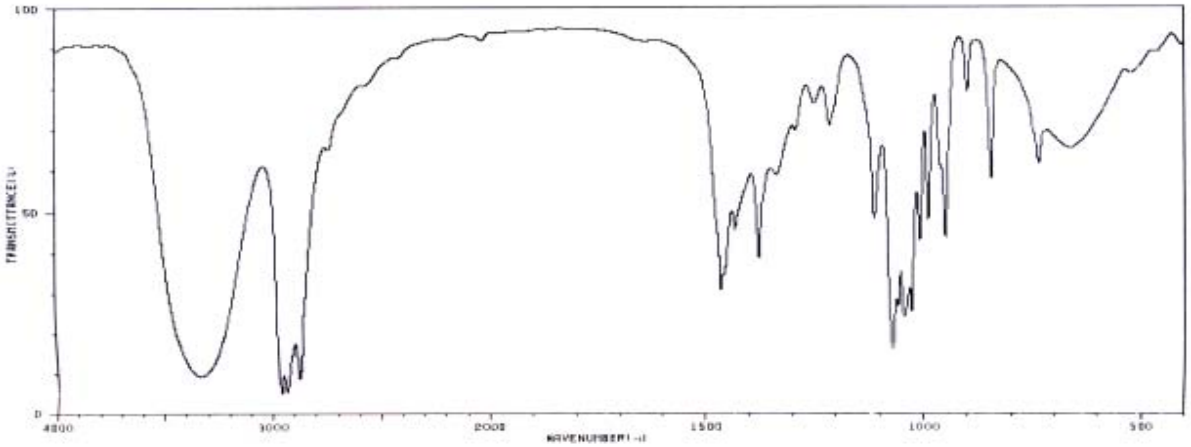
1. SPECTRUM A



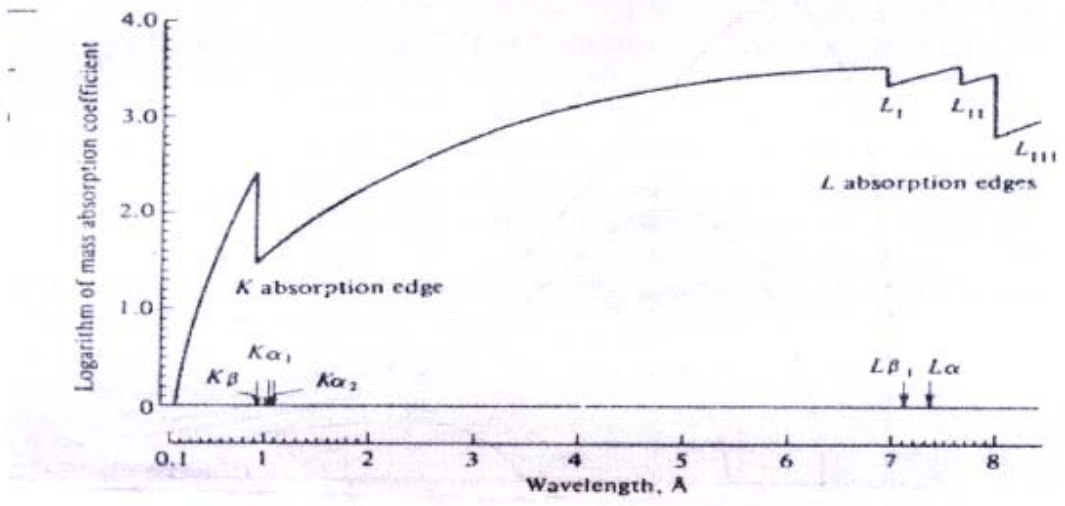
2. SPECTRUM B



3. SPECTRUM C



4. SPECTRUM D



element	K absorption edge	K alpha1	K beta	L alpha
Copper	1.380	1.541	1.392	13.33
Bromine	0.918	1.048	0.934	7.399
molybdenum	0.620	0.709	0.632	5.406

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T.E. (Polymer Engineering) (Semester – I) Examination, 2010
POLYMER CHEMISTRY – I (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Explain the concept of weight average and number average molecular weight in polymers. **8**

   b) Discuss determination of $\overline{M}v$. **9**

   OR

2. a) Explain any one method to determine MWD in polymers. **8**

   b) Explain the following with suitable examples. **9**
   1) Swelling
   2) Stoichiometry.

3. a) Compare bulk and suspension polymerization in detail. **8**

   b) Explain kinetics of free radical polymerization. **9**

   OR

4. a) Write a note on inhibition and retardation reactions. **8**

   b) Write a note on initiators in ionic polymerization. **9**

5. a) Show the mechanism of ROP for ε-caprolactum. **8**

   b) Derive Carother's equation. **8**

   OR

6. a) Give distinct features of interfacial and melt polymerization. **8**

   b) Derive kinetic equation for step polymerization. **8**

P.T.O.

SECTION – II

7. a) Derive copolymerization equation. **8**

   b) Give the method of synthesis of copolymers by chain mechanism. **9**

OR

8. a) Give commercial applications of copolymerization. **8**

   b) Write a note on types of copolymerization behavior. **9**

9. a) Define degradation. Explain types of degradation. **8**

   b) Explain the importance of polymer modification with suitable reactions. **9**

OR

10. a) Write any three specific group reactions. **8**

    b) Compare recycling, incineration and biodegradation. **9**

11. a) Explain with suitable examples the properties of stereoregular polymers and their non-stereoregular counterparts. **8**

    b) Discuss the mechanism of polymerization involving zirconocene catalyst. **8**

OR

12. a) Compare monometallic and bimetallic mechanism of polymerization. **8**

    b) Write a note on forces of stereo regulation in alkene polymerization. **8**

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T.E. (Polymer) (Semester – I) Examination, 2010
POLYMER MATERIALS (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What is the difference between commodity, engineering and high performance polymers ? Give two examples of each. **3**
   b) What is EVA ? State 2 properties and 2 applications of the same. **3**
   c) Write a short note on compounding of polypropylene. **4**
   d) Polyvinylacetate exhibits cold flow. Explain why ? **3**
   e) Give 2 properties and two applications of polyvinylalcohol. **2**
   f) State the main features to be borne in mind while processing of polythylene. **3**

OR

2. a) Differentiate between LDPE and HDPE. **3**
   b) What is LLDPE ? How is it prepared ? **3**
   c) How are PP films prepared ? Explain. **4**
   d) Give 2 outstanding properties and 2 applications of polyvinylacetate. **2**
   e) Polyvinyl alcohol is not prepared by the polymerisation of vinylalcohol why ? How is it prepared ? **3**
   f) Explain the various steps in the manufacture of polypropylene. **3**

P.T.O.

3. a) What is k-value in case of PVC ? How is it calculated ? What is the range of values for commercial polymers ? **5**

   b) Why does polystyrene need modification ? State the modified forms of P.S. Give 2 properties and 2 applications of each form. **6**

   c) Why PTFE is chemically inert ? Explain the sintering process carried out for PTFE . **5**

OR

4. a) Differentiate between plastisols, organosols plastigels in case of PVC. **5**

   b) Explain the process for manufacture of expandable polystyrene. **5**

   c) Give 2 properties and 2 applications each of **6**

   i) PTFE ii) ABS iii) PVC

5. a) Why do we need to prepare a prepolymer syrup in casting of PMMA sheets ? How is the prepolymer prepared ? Explain the process of casting of PMMA sheets. **6**

   b) What are the features to be borne in mind while processing of polycarbonate ? Give 2 applications of polycarbonate. **5**

   c) What is the effect of degree of substitution on the properties of cellulose acetate ? **5**

OR

6. a) Why does cellulose need to be converted to cellulose Acetate ? How is it done ? **5**

   b) PMMA is used in taillight covers in auto mobiles, why ? Give 4 transparent polymers. **6**

   c) State the points to be borne in mind while processing polycarbonate. **5**

SECTION – II

7. a) Enumerate the 4 different types of adhesives. Give examples. **6**

   b) Give the basic definitions of a paint, varnish, stain, lacquer and a primer. **5**

   c) What is the difference between convertible and non-convertible coatings ? Give examples. **5**

OR

8. a) List the various components used in a paint formulation. **6**

   b) State the important properties to be considered while selecting a solvent for paint application. **5**

   c) Explain the role of fillers in case of adhesives. **5**

9. a) Give a brief outline of latex technology. **6**

   b) What is the significance of mastication ? Explain mastication w.r.t. Natural rubber. What is the role of peptisers in mastication ? **6**

   c) List the various additives added in a typical rubber compound. **6**

OR

10. a) What are the various vulcanising agents used with rubbers ? How is Natural rubber and chloroprene rubber vulcanised ? Give reactions. **6**

    b) Give a brief outline of raw rubber technology. **6**

    c) Give the various ways by which rubber latex is concentrated. **6**

11. a) Differentiate between hot and cold SBR grades. **5**

    b) What are Thermoplastic elastomers ? What are the advantages and disadvantages of thermoplastic elastomers compared to conventional elastomers ? **5**

    c) Give the rubber used in the following applications and state why ? **6**

    i) LPG tubes

    ii) Tyre tubes

    iii) Conveyor belts.

OR

12. a) Write the structure of the following rubbers : **5**

    i) Natural rubber

    ii) SBR

    iii) Butyl rubber

    iv) Chloroprene rubber

    v) Nitrile rubber

    b) What is the effect of acrylonitrile content on the properties of nitrile rubber ? **5**

    c) Write a short note on thermoplastic elastomers. **6**

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T.E. (Polymer) (Semester – I) Examination, 2010
POLYMER STRUCTURE – PROPERTY RELATIONSHIP
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer to Section – **I** and Section – **II** should be written on **separate** answer book.*

*2) Solve **3** questions from Section – **I** and **3** questions from Section – **II**.*

*3) **Neat** diagrams should be drawn **whenever** necessary.*

*4) Figures to **right** indicate **full** marks.*

*5) Assume **suitable** data, **if necessary.***

*6) **Use** of electronic pocket calculator is **allowed**.*

SECTION – I

1. a) Why is it difficult to apply adhesive on PTFE sheet ? **3**

   b) Why poly (phenylene sulphide) i.e. PPS is useful in high temperature applications ? **3**

   c) Write a short note on "Impurities from Polymerization Reaction" that affect polymer properties. **8**

   d) Comment on effect of aliphatic C=C bond compared to aliphatic C-C bond on polymer properties. **4**

OR

2. a) Comment on C-O-C bond in polyesters. **4**

   b) What causes electrical conductivity in polyacetylene ? **3**

   c) Write a short note on "Monomeric Additives" that affect polymer properties. **8**

   d) Explain in brief importance of side groups defining polymer properties. **3**

P.T.O.

3. a) Explain what is molecular weight distribution (MWD). What is the significance of narrow and broad MWD in regards processing and properties ? **8**

   b) Give the list of additives used for polymers and comment in brief how they affect polymer properties. **5**

   c) Explain the role of molecular weight in defining polymer processability. **3**

OR

4. a) Explain what is the effect of molecular weight on polymer properties by giving the example of polyethylene. **4**

   b) Write a short note on "Conversion to High Molecular Weight during Monomer Casting and Processing to Thermosetting Resins". **8**

   c) Comment on effect of molecular weight on any four polymer properties. **4**

5. a) What are the requirements needed by polymer to have good adhesion, properties ? **5**

   b) Explain potential energy barrier and its significance. **6**

   c) Explain the following terminologies – Fringed Micelle Model, Spherulites, Lamella. **5**

OR

6. a) Discuss the effect of molecular flexibility on properties like Tg, Tm, crystallinity. **8**

   b) Explain the effect of main chain substituents on flexibility. **6**

   c) Why polyvinyl alcohol can be used in adhesion applications ? **2**

SECTION – II

7. a) Some polymers have density less than 1 while some have more than 1. Explain the reason behind this. **3**

   b) What makes polyamides (Nylons) have higher melting point than polyolefins ? **2**

   c) If crystallinity of PE increases, will the mechanical properties improve ? Also, explain with reasons between amorphous polystyrene and semi-crystalline PE which one will have better mechanical properties. **5**

d) Will PTFE have high or low Tg and why ? Also, explain out of polyvinyl fluoride (PVF) and polyvinylidene fluoride (PVDF) which one will have high Tg ? **4**

e) What is the effect seen due to addition of plasticizer in a polymer ? When can we see the antiplasticizer effect ? **4**

OR

8. a) Give list of factors that would be the reason to affect polymer properties. **4**

b) What happens morphologically at Tg and will it be correct to say that crystalline polymers do not undergo Tg ? Justify. **4**

c) What happens during crystallization ? Also, explain the factors affecting crystallization. **5**

d) Explain the effect of crystallinity on processing and also vice-a-versa. **5**

9. a) How is orientation different that crystallization ? Explain cold, warm and solution stretching. **8**

b) Explain what is intermolecular bonding and how many types of intermolecular forces are present ? **8**

OR

10. a) Explain solubility parameter, cohesive energy density (CED) and how it can be found for liquids as well as polymers ? **6**

b) Explain ionic covalent bonds and its significance. **4**

c) Write short note on “London Dispersion Forces (LDF) and Factors affecting it”. **6**

11. a) Explain with any one example how temporary heterogeneity is required during processing and later converted into permanent continuous solid form. **6**

    b) Write short note on “Foams, their Internal Structure and Properties”. **6**

    c) What role is performed by Membranes ? **4**

OR

12. a) What is meant by chemical microheterogeneity ? **4**

    b) Explain with example semicompatible blends. **4**

    c) Write a short note on “Composites, the Internal Structure and Properties”. **4**

    d) Write a short note on “Pastes and their applications”. **4**

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T.E. (Polymer) (Semester – I) Examination, 2010
DESIGN OF EQUIPMENT AND MACHINERY ELEMENTS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer Q. No. **1** or **2**, Q. No. **3** or **4** and Q. No. **5** or **6** from Section – **I**. Answer Q. no. **7** or **8**, Q. No. **9** or **10** and Q. No. **11** or **12** from Section – II.*

*2) Figures to the **right** indicate **full** marks.*

*3) Assume suitable design data, if **required**.*

*4) **Use** of pocket calculator, graph paper is **allowed**.*

*5) Answers to the **two** Sections must be written in **two separate** answer books.*

SECTION – I

1. a) The normal stresses on two planes at right angles to each other are 60 MPa tensile and 60 MPa compressive. This is accompanied by shear stress of 20 MPa. Find maximum and minimum principle stresses. Find also maximum shear stress using Mohr circle diagram. **6**

   b) Design a rectangular key for a shaft of 60 mm diameter. The shearing and crushing stresses for key and shaft material are 42 MPa and 70 MPa respectively. **6**

   c) Explain any two failure theories for bi-axial stress system. **6**

2. a) Interpret following materials as per BIS standard (**any four**) : **4**

   i) Fe E 650 ii) 40 Cr 4 M_{02}

   iii) X 10 Cr 18 N_{19} iv) SG 400/15

   v) BM 300 vi) 40 C 8

   b) Write a short note on high speed steel or cast iron. **4**

   c) Draw a neat sketch of marine type flange coupling and explain design procedure. **4**

   d) Draw a neat sketch of protected type flange coupling and give design procedure for

   i) Design of hub ii) Design of key

   iii) Design of flange iv) Design of bolts. **6**

P.T.O.

3. a) A machine drive shaft (Fig. 1) has pulley weighing 250 N and is located 300 mm from the center of bearing. The diameter of pulley is 200 mm and maximum power transmitted is 1.5 KW at 150 rpm. The angle of lap of belt is 180° and coefficient of friction between flat belt and pulley is 0.3. The shock and fatigue factors for bending and twisting are 1.5 and 2 respectively. The allowable shear stress in shaft is 35 MPa. Calculate diameter of shaft. **8**

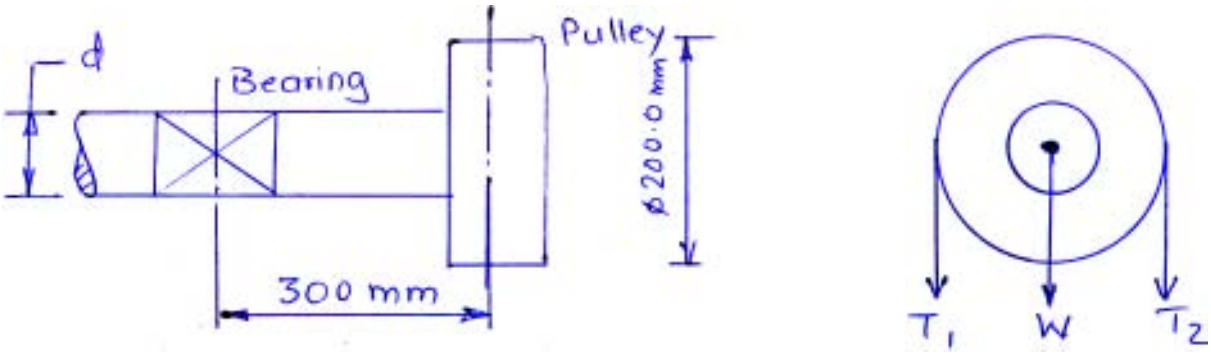

Figure 1

b) A flat belt, 8 mm thick and 100 mm wide transmits power between the two pulleys, running at 1600 m/min. The mass of belt is 0.9 kg/m length. The angle of lap at smaller pulley is 165° and coefficient of friction between the belt and pulley is 0.3. If the maximum permissible stress in the belt is 2 MN/m^2.
Find :

1) Maximum power transmitted
2) Initial tension in the belt. **8**

4. a) Derive an expression for length of flat open belt drive. **8**

b) A steel spindle transmits 5 KW at 500 rpm. The angular deflection should not exceed 0.25° per meter of the spindle. Modulus of rigidity for the material of spindle is 80 GPa. Find diameter of spindle and shear stress in spindle. **4**

c) Write advantages of V-belt over flat belt drive. **4**

5. a) The main journal bearing of a steam engine is 100 mm in diameter and 175 mm long. The bearing supports a load of 28 KN at 250 rpm. If the ratio of diametral clearance to the diameter is 0.001 and absolute viscosity of the lubricating oil is 0.015 kg/m-sec,

   Find :

   1) Coefficient of friction

   2) Heat generated at the bearing due to friction. **6**

   b) With neat sketches, discuss at least two types of ball bearings. **5**

   c) Explain merits and demerits of rolling contact bearings over sliding contact bearings. **5**

6. a) Explain with a neat sketch various terminologies used to describe spur gear. **4**

   b) Write short note on any **one** of the following :

   i) Norton gear drive

   ii) Ruppert drive. **4**

   c) A bronze spur pinion rotating at 620 rpm drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 85 MPa and 110 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 10 mm. The face width of both gears is 100 mm. Find the power that can be transmitted from the standpoint of strength.

   Take velocity factor

   $$Cv = \frac{3}{3+v}$$

   Lewis tooth form factor as

   $$Y = (0.154) - \left(\frac{0.912}{7}\right)$$

   Service factor C_s = 1. **8**

SECTION – II

7. a) Draw neat circuit diagrams for carrying following hydraulic functions (**any three**) : **12**

   i) Counter balance circuit

   ii) Regenerative circuit

   iii) Two pump unloading circuit

   iv) Basic hydraulic rotary drive with speed control using bi-directional hydromotor.

   b) Draw a neat sketch of brake valve and explain its functioning during acceleration, running and braking with a circuit diagram. **6**

8. a) Explain closed type (All ports blocked) and float type center condition of four way directional control valve. **4**

   b) Draw a neat sketch of internal gear pump and explain functioning of the pump. **7**

   c) With a neat sketch explain balanced vane type hydromotor. **7**

9. a) Explain any two types of accumulator designs. **5**

   b) Explain the design of intensifier and its use in injection moulding machine. **4**

   c) Draw a neat sketch of cushioning type hydraulic cylinder and discuss its use in injection moulding machine. **4**

   d) Explain the concept of nozzle contact force. **3**

10. a) Draw hydraulic circuit and give valve sequencing for following operations using conventional hydraulics :

   i) Injection – fill and hold phase

   ii) Injection unit forward and backward

   iii) Plasticizing with backpressure control. **10**

   b) Draw net sketches – following types lock and block systems (**any one**) :

   i) lock and block system with clamp cylinders on tie bar

   ii) lock and block system with threaded central pressure plate. **6**

11. a) What are the various stresses induced in a pressure vessel subjected to combined loading ? How is the thickness of such vessel evaluated ? **6**

    b) A hemispherical head with 1 meter diameter is subjected to internal pressure of 200 kg/cm^2. Assuming welded joint efficiency of 100% and permissible stress of 1600 kg/cm^2, calculate the thickness of head. **4**

    c) Explain area compensation method used in case of reinforced nozzle. **6**

12. a) With a neat sketch, explain any one type of heating coil used in pressure vessel. **6**

    b) A pressure vessel 1 meter in internal diameter operates at an internal pressure of 10 kg/cm^2. Weight of vessel including its contents is 7000 kg. Torque over the vessel is 60 kg-cm. Assume welded joint efficiency as 85%. Neglect bending moment. Take corrosion allowance of 2 mm. Calculate various stresses induced in the vessel and verify that the equivalent stress is less than permissible stress in the material. **8**

    c) List different types of joints used in pressure vessel. **2**

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T.E. (Polymer Engineering (Semester – I) Examination, 2010
MASS TRANSFER AND REACTION ENGINEERING
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw **neat** diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*
*5) **Use** of logarithmic table, electronic pocket calculators is **allowed**.*

SECTION – I

1. a) Write a note on analogies between Heat and Mass Transfer. **5**

   b) Derive the expression for Steady State diffusion of gas A through non-diffusing gas B and discuss the necessary equation for steady state diffusion in multi component gas system. **8**

   c) Write the applicable convective flux equation for diffusion of A through non diffusing B and for Equimolar counter diffusion. **5**

OR

2. a) The diffusivity of CCl_4 through O_2 was determined by Arnold Evaporating cell in steady state with cross sectional area of 0.82 cm^2, operated at 273°K and 755 mm of Hg. The average length of diffusion path was 17.1 cm. If 0.0208 cm^3 of CCl_4 was evaporated in 10 hr of steady state operation, what should be diffusivity of CCl_4 through O_2 ? Vapour pressure of CCl_4 at 273°K = 33 mm of Hg. Density of liquid CCl_4 = 1.59 gm/cm^3. **8**

   b) Write a note on Overall Mass transfer Coefficient. **5**

   c) A large volume of pure gas B at 2 atm pressure is flowing over the surface from which pure A is vaporizing. The liquid A completely wets the surface. The partial pressure of A at the surface at 298°K is 0.20 atm. $k_y = 6.78*10^{-5}$ kgmole/sec.m^2.mole frac. Calculate k_y, k_G, N_A, the vaporization rate. **5**

P.T.O.

3. a) Write a note on minimum liquid to gas ratio for gas absorber. **6**

   b) Write a note on :

      a) Liquid-Liquid extraction,

      b) "Choice of Solvent" for gas Absorption. **10**

OR

4. a) Write a note on simple distillation. **6**

   b) In an absorption tower NH_3 from AIR-NH_3 mixture is absorbed in water in countercurrent flow with gas phase at 293°K at 1 std atm. NH_3-free water at 293°K introduced from top of tower at 35 kg/hr while gas at rate 45 m^3/hr. So NH_3 concentration is reduced from 3.5% to 1.25% by volume. Find (L_s/G_s) actual/(L_s/G_s) minimum. **10**

Equilibrium Mole ratio Data :

$\mathbf{X_A}$	$16.5*10^{-3}$	$25.1*10^{-3}$	$34.1*10^{-3}$	$45.6*10^{-3}$	$72.1*10^{-3}$
$\mathbf{Y_A}$	$21*10^{-3}$	$32*10^{-3}$	$42*10^{-3}$	$54*10^{-3}$	$81*10^{-3}$

5. a) Write a note on Drying Equipments. **8**

   b) Discuss the term Drying-Rate Curve and Total Drying time. **8**

OR

6. a) Batch of wet solid is to be dried from free moisture content X_1 = 0.48 kg H_2O/kg Dry solid to X_2 = 0.04 kg H_2O/kg Dry solid. Weight of dry solid = 399 Kg and area = 18.58 m^2. Find the total drying time. **12**

X (Free Moisture Content)	0.195	0.150	0.10	0.065	0.05	0.04
R (Drying Rate)	1.51	1.21	0.9	0.71	0.37	0.27

   b) Discuss the terms : Free moisture and Equilibrium Moisture content of solid. **4**

SECTION – II

7. a) Explain the importance of reaction engineering in chemical industry. **4**

   b) Discuss the followings : Order, Molecularity, Rate Constant, and Temperature Dependency of rate of reaction. **12**

OR

8. a) Write a short note on Classification of chemical reactions useful for the reactor design. **8**

   b) With the following mechanism prove that the rate of reaction for N_2O_5 is of first order with reference to N_2O_5. **8**

   $r_{N2O5} = KC_{N2O5}/K\ C_{NO2} + 1$

   Mechanism : $N_2O_5 \xrightarrow{K1} NO_2 + NO_3^*$

   $NO_2 + N_3^* \xrightarrow{K2} N_2O_5$

   $N_3^* \xrightarrow{K3} NO^* + O_2$

   $NO^* + N_3^* \xrightarrow{K4} 2NO_2$

9. a) Homogeneous liquid phase reaction $A \longrightarrow R$ and $-r_A = KC_A^2$ takes place with 50% conversion in MFR. What will be the conversion if this reactor is replaced by one six times as large as first reactor-all else remaining unchanged ? **9**

   b) Reaction $A \longrightarrow$ Product is gas phase homogeneous reaction. This reaction follows rate equation of first order $-r_A = KC_A$. For feed rate of 4 m^3/hr and initial concentration of 6 mole/lit of A. For 60% conversions calculate the volume of PFR require. **9**

OR

10. a) From the study of photochemical decomposition of aqueous bromine in bright sunlight following data were obtained : **14**

Time (min.)	0	10	20	30	40	50
Concentration of Br_2 (PPM)	2.45	1.74	1.23	0.88	0.62	0.44

Determine whether the reaction rate is zero, first or second order in bromine and calculate the reaction rate constant.

b) Discuss the term space time and space velocity. **4**

11. a) Write a short note on different types of reactor in series. **8**

b) Compare the sizes of PFR and MFR for first order reaction in detail. **8**

OR

12. a) Write different factors to be considered while designing of polymer reactors. **8**

b) The reaction is $A + B \longrightarrow$ Products with known kinetics – r_A = (500 lit/mole min) $C_A C_B$ is take place in an experimental tubular reactor (PFR) having volume 0.1 lit and volumetric flow rate of 0.05 lit/min, concentration of reactants in feed $C_{AO} = C_{BO} = 0.01$ mole/lit. Find Part a : fractional conversion of reactant can be expected and Part b : For the same conversion as in part a what size of ideal CSTR is needed. Compare both the results and make comments. **8**

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T.E. (Computer) (Semester – I) Examination, 2010
DATA COMMUNICATION
(2008 Course) (New)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Assume suitable data, if **necessary**.*

*4) Write answer in **separate** answer book for **each** Section.*

SECTION – I

1. a) With help of block diagram, explain BFSK transmitter and receiver. **8**
   b) Explain WDM and CDMA multiplexing techniques. **8**

OR

1. a) What is FSK ? Explain FSK generation, bandwidth of FSK signal and detection of FSK. **8**
   b) Explain Quadrature Amplitude Modulation and Phase Modulation. **8**
2. a) Explain with block diagram PCM Encoder and decoder. **8**
   b) Describe adaptive quantization with forward estimation and backward estimation. **8**

OR

2. a) What is mean by quantization noise ? Discuss the factors in which it depends and techniques used for reducing its effects. **8**
   b) Explain how adaptive delta modulation improve the tolerance to slope overload. **8**
3. a) List and explain all types of ARQ system. **10**
   b) What is Shannon's information Rate ? Why it is difficult to achieve ? **4**
   c) Define information rate and write unit of information rate. **4**

OR

3. a) Explain following terms related to codes : **10**
   i) Code word ii) Code rate iii) Hamming weight of code word
   iv) Code efficiency v) Hamming distance
   b) Explain cyclic redundancy check code. **4**
   c) Explain why error detection and correction required. **4**

P.T.O.

SECTION – II

4. a) Explain Bluetooth protocol architecture. **8**

   b) Write short notes on PSTN. **8**

OR

4. a) Explain with diagram 802.16 protocol stack and frame format. **8**

   b) What is VLAN ? State the advantages of VLAN. Explain how to setup VLAN using Layer-2 switches. **8**

5. a) List and explain wireless transmission media. **8**

   b) Write the comparison between circuit switching, packet switching and message switching. **8**

OR

5. a) Write the functions of repeater, hub, NIC, Media converter, transceiver, switch, router and bridge. **8**

   b) Explain the types of frequency hopping. **8**

6. a) Explain piggybacking with advantages and disadvantages. **6**

   b) Explain frame types of HDLC. **6**

   c) Write the problems in static and dynamic channel allocation. **6**

OR

6. a) Explain persistent and non-persistent CSMA. **6**

   b) Write the short notes on stop-and-wait protocol. **6**

   c) Describe limited contention protocol in details. **6**

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T.E. (Computer Engineering) (Semester – I) Examination, 2010
MICROPROCESSORS AND MICROCONTROLLERS (New)
(2008 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *1) In Section **I**, attempt Q. No. **1** or Q.No. **2**, Q. No. **3** or Q.No. **4**, Q.No. **5** or Q.No.**6**.*
*2) In Section **II**, attempt Q.No. **7** or Q. No.**8**, Q. No.**9** or Q.No.**10**, Q.No.**11** or Q.No.**12**.*
*3) Answers to the **two** Sections should be written in **two** separate books.*
*4) **Neat** diagrams must draw **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume suitable data **if necessary**.*

SECTION – I

1. a) Compare 80386, 80486 and Pentium based on architecture. **6**
   b) What is the function of each of the following pins ? **6**
      i) $\overline{\text{BRDY}}$ ii) $\overline{\text{ADS}}$ iii) $\overline{\text{BE0}} - \overline{\text{BE7}}$
   c) What is Branch Prediction in Pentium ? Explain with diagram. **6**

OR

2. a) With the help of neat block diagram, explain the architecture of Pentium processor. **8**
   b) Explain Data Cache organisation of Pentium. **6**
   c) What is the use of $\text{WB}/\overline{\text{WT}}$ and $\overline{\text{FLUSH}}$ pins of Pentium. **4**

3. a) With the help of neat diagram, explain non-pipelined read bus cycle of Pentium. **6**
   b) List and explain protected mode registers of Pentium Processor. **6**
   c) What is the difference between RESET and INIT pins of Pentium. **4**

OR

4. a) Describe different addressing modes in Pentium with suitable examples. **8**
   b) Draw and explain memory interfacing mechanism for 32 bit and 16 bit memory with Pentium. **8**

P.T.O.

5. a) Describe linear to physical address translation mechanism in Pentium. Draw the required data structures. **8**

   b) Draw and explain the use of control registers in Pentium. **8**

OR

6. a) How pages can be protected in Pentium ? Explain in detail. **8**

   b) Describe logical to linear address translation mechanism in Pentium. Draw the required data structures. **8**

SECTION – II

7. a) What is Multitasking ? Explain registers and descriptors are involved to support this feature in Pentium. **8**

   b) How I/O devices are handled by Pentium processor ? **6**

   c) What are different classes of exception ? **4**

OR

8. a) How interrupts are handled in protected mode ? Explain with the help of neat diagram. **8**

   b) Explain Virtual Mode in Pentium. How does Pentium enters virtual mode ? **6**

   c) Explain Nested Task in Pentium. **4**

9. a) Explain the features of 8051 Microcontroller. **6**

   b) Draw and explain Program Status Word of 8051 Microcontroller. **6**

   c) Explain MOVC and MOVX instruction of 8051 Microcontroller. **4**

OR

10. a) What are different addressing modes in 8051? Explain with suitable examples. **6**

    b) Explain how I/O pins of 8051 can be both input and output. **6**

    c) What is the function of EA and $\overline{\text{PSEN}}$ pins of 8051 Microcontroller ? **4**

11. a) Describe different Timer modes of 8051 Microcontroller. **8**

    b) Explain features and architecture of 8096 Microcontroller. **8**

OR

12. a) What are the different sources of interrupts in 8051 ? Explain interrupts handling mechanism in 8051. **8**

    b) Describe serial port on 8051 with the help of SCON. **8**

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T.E. (Computer) (Semester – I) Examination, 2010
DIGITAL SIGNAL PROCESSING (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. A) How an arbitrary DT sequence can be represented by convolution operation ? Obtain linear convolution of u(n) and δ (n) using graphical method. **8**

   B) State linearity and time invariant properties of a DT system and test it for

   $y(n) = x(n) - 2.x(n-2)$. **8**

   OR

2. A) How a DT system is represented/described in time domain ? Define the impulse response of a DT system and show that for a causal system. **8**

   $h(n) = 0$ for $n < 0$

   B) Why the problem of aliasing is observed during sampling process ? Show that all the frequencies $F_K = F_O \pm K.F_S$, K: integer are the aliases of frequency F_O. **8**

3. A) Compare N point DFT with FT. What is the significance of N in DFT ? Why it is necessary to have $N \geq L$ where L : length of a DT signal. **10**

   B) State and prove windowing theorem of a Fourier Transform (FT). **8**

   OR

P.T.O.

4. A) Obtain DT frequencies $\{W_K\}$ for 6 point DFT. State the convolution and periodicity property of DFT. What is DFT spectral leakage ? **10**

   B) Explain how DFT can be used for linear filtering. How N-pt. circular convolution can be used to obtain linear convolution ? **8**

5. A) How computational complexity of N-point DFT is reduced using FFT algorithm ? What is in-place computation and bit-reversal indexing in FFT ? **8**

   B) Using ZT properties, obtain ZT of a DT signal x(n) = 2n. u (–n –1) sketch the ROC. **8**

OR

6. A) Derive the first stage of DIF (decimation in frequency) FFT algorithm. Draw the basic butterfly structure for the same. **8**

   B) Obtain a causal sequence x(n) from its ZT **8**

$$X(Z) = \frac{3}{Z - \frac{1}{4} - \frac{1}{8Z}}$$

SECTION – II

7. A) Define a system function H(Z). What is pole zero plot of a system ? Determine H(Z) and draw a pole zero plot for a system. **10**

$$y(n) + \frac{3}{4}\, y(n-1) + \frac{1}{8}\, y(n-2) = x(n) + x(n-1)$$

   B) Express system function H(Z) for FIR and IIR system from the N^{th} order difference equation. How properties of DT system can be described using H(Z) ? **8**

OR

8. A) Knowing H(Z), how frequency response of a system can be obtained ? Use simple geometric construction to obtain the frequency response of a system having h(n) = {0.5, 0.5}. **10**

   B) Determine the impulse response of a system. **8**

   y(n) = 2x(n) – x(n – 1) – 3y (n – 1) – 2y (n – 2)

9. A) Define a DT filter. What do you mean by a linear phase response ? What is group delay ? State the advantages and disadvantages of FIR filter over an IIR filter. **8**

   B) What is frequency prewarping ? Design second order low pass filter using BLT method having

   $H(S) = \frac{1}{S^2 + \sqrt{2}\,S + 1}$ with cut-off freq. F_c = 1KHz and sampling frequency F_s = 10 KHz. Use frequency prewarping. **8**

OR

10. A) Compare Hanning window with rectangular window. Write the algorithmic steps to design an FIR filter using Hanning window. **8**

    B) Stable analog filter always gives stable digital filter. Justify the statement. Explain impulse-invariance method for the design of an IIR filter. **8**

11. A) Obtain direct and cascade form FIR filter structure for a system having

    $H(Z) = (1 + Z^{-1})\,(1 + \frac{1}{2}\,Z^{-1} + \frac{1}{2}\,Z^{-2} + Z^{-3})$ **8**

    B) Obtain direct form – I and direct form – II IIR filter structure for a system

    $H(Z) = \frac{Z^2 + \frac{1}{3}Z}{Z^2 - \frac{3}{4}Z + \frac{1}{8}}$ **8**

OR

12. A) How DSP processors are different than conventional microprocessors ? List the important features of ADSP 21XX DSP processor. What is DAG ? **8**

    B) How image is represented by digital computer ? Explain the application of DSP in image processing w.r.t. image enhancement. **8**

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T.E. (Computer) (Semester – I) Examination, 2010
THEORY OF COMPUTATION
(2008 Course) (New)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answer **three** quetions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

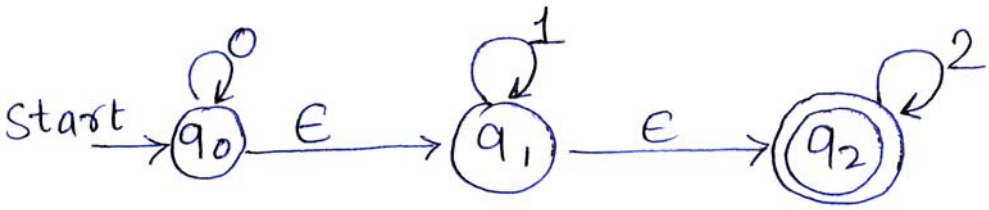
1. a) Define the following terms with example. **6**
   1) Symbol 2) Alphabet
   3) DFA

   b) Design a Mealy machine that accepts strings ending in '00' and '11'. Convert the Mealy machine to the equivalent Moore machine. **10**

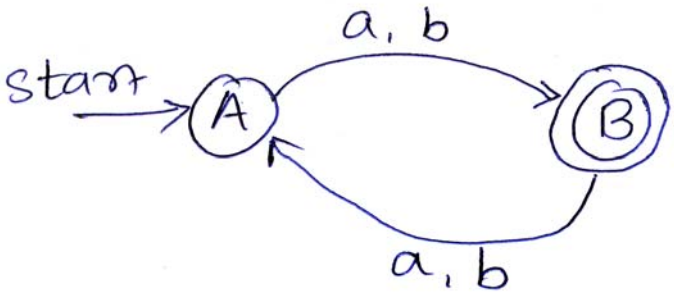
OR

2. a) Define the following terms with example. **6**
   1) Basic machine 2) Moore Machine
   3) Mealy machine

   b) Consider the following NFA with E-transitions. Convert this NFA to **10**
   1) NFA without ∈-moves 2) DFA



3. a) Consider the following transition diagram. Convert it to the equivalent regular expression. **6**



b) Find a regular expression corresponding to each of the following subsets of $\{0, 1\}^*$. **6**

1) The language of all strings containing exactly two 0's.

2) The language of all strings containing atleast two 0's.

3) The language of all strings not containing the substring 00.

c) Prove the formula. **4**

1) $\phi^* = \in$ 2) $(r^* s^*) = (r + s)^*$

OR

4. a) For the following regular expression, draw an FA recognizing the corresponding language. **6**

r = (1+10)* 0

b) Consider the two regular expressions

r = 0* + 1* S = 01* + 10* + 1*0 + (0* 1)*

1) Find a string corresponding to s but not to r.

2) Find a string corresponding to both r and s.

3) Find a string in {0, 1}* corresponding to neither r nor s. **6**

c) Explain the use of regular expressions in unix with any one example. **4**

5. a) Simplify and convert the following CFG to Chomsky Normal Form. **12**

$S \rightarrow AACD$

$A \rightarrow aAb/\in$

$C \rightarrow aC/a$

$D \rightarrow aDa/bDb/\in$

b) Consider the CFG with productions

$S \rightarrow S + S/S - S/S^*S/S/S$ /(S)/a

Is the grammar ambiguous ? If 'Yes' find the equivalent unambiguous grammar. **6**

OR

6. a) Decribe the language generated by each of these grammars. Justify your answer with an example. **12**

1) $S \rightarrow a\ S\ a \mid b\ S\ b \mid \in$

2) $S \rightarrow a\ S\ a \mid b\ S\ b \mid a \mid b$

3) $S \rightarrow a\ S\ b \mid b\ S\ a \mid \in$

4) $S \rightarrow SS \mid bS \mid a$

b) Convert the following grammar to Griebach Normal form. **6**

$S \rightarrow ABA|AB|BA|AA|A|B$

$A \rightarrow aA|a$

$B \rightarrow bB|\ b.$

SECTION – II

7. a) Construct pushdown automata for $L = \{ W\ C\ W^R / W \in (a + b)^*\}$ and W^R is reverse string of W. **6**

b) Construct pushdown automata for the given CFG with productions **6**

$S \rightarrow a\ AA$

$A \rightarrow bS|\ aS$

$S \rightarrow a$

c) Explain the equaivalence of PDA with acceptance by final state and empty stack. **6**

OR

8. a) Consider the PDA with following moves. Construct a CFG equivalent to PDA. **8**

$M = (\ \{q_0, q_1\}, \{0, 1\}, \{B, R\}, \delta, q_0, R, \phi\ )$

Where δ is defined as :

$\delta(q_0, 0, R) = (q_0, BR)$

$\delta(q_0, 0, B) = (q_0, BB)$

$\delta(q_0, 1, B) = (q_1, B)$

$\delta(q_1, 1, B) = (q_1, B)$

$\delta(q_1, 0, B) = (q_1, \in)$

$\delta(q_1, \in, R) = (q_1, \in)$

b) Construct a PDA equivalent to the following CFG **6**

$S \rightarrow 0AA$

$A \rightarrow 0S/1S/0$

c) Explain how DPDA is different from NPDA. **4**

9. a) Construct a turing machine for reversing a string. **8**

b) Design a Post machine for the language $L = \{0^n 1^{2n}\}$. **8**

OR

10. a) Construct a turing machine for finding 2's complement of a binary number. **8**

b) Explain the following terms in relation with turing machine. **8**

1) Solvability 2) Semi-solvability and

3) Unsolvability.

11. a) What is post correspondence problem ? Explain with example. **8**

b) What is Halting problem ? Prove that halting problem is undecidable. **8**

OR

12. a) Explain the following terms with example.

1) Computational complexity

2) P - class problems

3) NP- class problems

4) Modified PCP problem. **8**

b) Define the following terms

1) Recursive language

2) Recursively enumerable language

3) Intractable problems

4) Universal turing machine. **8**

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T.E. (Information Technology) (Semester – I) Examination, 2010
OPERATING SYSTEMS (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **all** questions for **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. A) What is the purpose of system calls and how do the system calls relate to operating system ? **8**

   B) What is an operating system ? State and explain the basic functions of operating system. **8**

   OR

   A) Discuss various architectures of operating system. **8**

   B) Write a shell script for sorting a given list of numbers using bubble sort. **8**

2. A) List the information in process control block and explain it. **8**

   B) What is a thread ? Define User Level Thread (ULT) and Kernel Level Thread (KLT). How is ULT mapped to KLT ? **8**

   OR

   A) Consider the following processes **12**

Processes	BT	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

   The processes are arrived in order P1 to P5 all at 0

   i) Draw Gantt chart to show the execution using FCFS, SJF, non pre-emptive priority (smaller priority number implies higher priority)

   ii) Calculate average TAT & WT.

   B) Explain real time scheduling. **4**

P.T.O.

3. A) List the requirement of Mutual Exclusion. **6**

   B) Write a semaphore solution for readers-writers problem. **6**

   C) Apply the Deadlock Detection Algorithm for following example and show the results

   Available [2 1 0 0]

Request	**Allocation**
2 0 0 1	0 0 1 0
1 0 1 0	2 0 0 1
2 1 0 0	0 1 2 0

6

OR

   A) What is the difference among deadlock avoidance, detection and prevention ? **8**

   B) Write a semaphore solution for dining philosophers problem. **6**

   C) Explain monitors in brief. **4**

SECTION – II

4. A) Draw a graph of degree of multiprogramming verses CPU utilization. Explain the nature of graph. **6**

   B) Explain with the help of a neat diagram how TLB can be used to improve Effective Access Time. **10**

OR

4. A) What are the common techniques for structuring the page table ? Explain at least three of the techniques. **10**

   B) For the following reference string.

   5, 6, 7, 8, 5, 6, 9, 5, 6, 7, 8, 9

   Count the number of page faults that occur with 3 frames and 4 frames using FIFO page replacement method. Discuss the result. **6**

5. A) A disk drive has 500 cylinders, numbered 0 to 499. The drive is currently serving a request at cylinder 255 and the previous request was at cylinder 143. the queue of pending requests in FIFO order is :

   84, 147, 91, 177, 286, 341, 78, 488, 38, 130.

   Starting from current head position, what is the total distance that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms.

   1) FCFS
   2) SSTF
   3) LOOK. **9**

   B) Explain various allocation methods for storage of files on disk. **9**

OR

5. A) Discuss the following :

   Directory Structure

   File Sharing. **9**

   B) Describe free space management techniques with suitable example. **9**

6. A) Discuss the security in Unix. **8**

   B) What is the difference between a threat and an attack ? Explain with example. **8**

OR

   A) Explain techniques and security policies to improve the resistance to threats. **8**

   B) Explain how the access matrix can be implemented effectively. **8**

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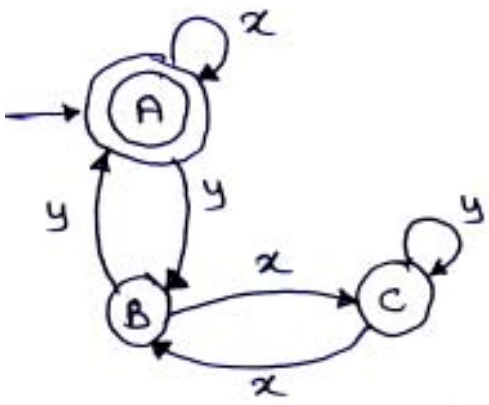
T.E. (Information Technology) (Semester – I) Examination, 2010
THEORY OF COMPUTATION (New)
(2008 Course)

Time : 3 Hours Max. Marks : 100

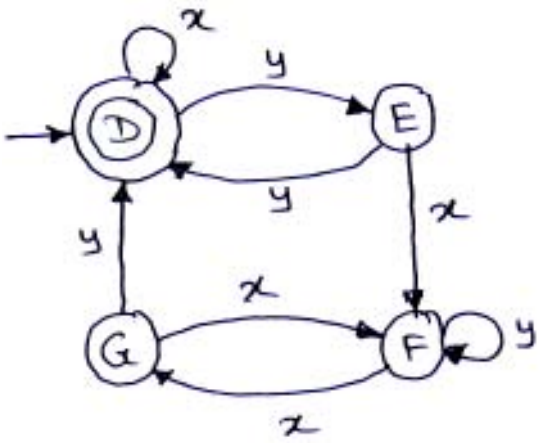
SECTION – I

1. a) Design an FSM for divisibility by 3 tester for a binary number. **6**

   b) Find out whether M1 and M2 are equivalent. **6**



(M1)



(M2)

   c) Construct DFA equivalent to NFA ({p, q, r, s}, {θ , 1}, δ, p, {q, s}) **6**

δ =

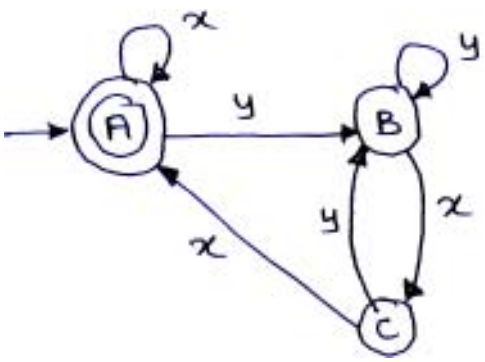
	θ	1
p	q, s	q
q	r	q, r
r	s	p
s	–	p

OR

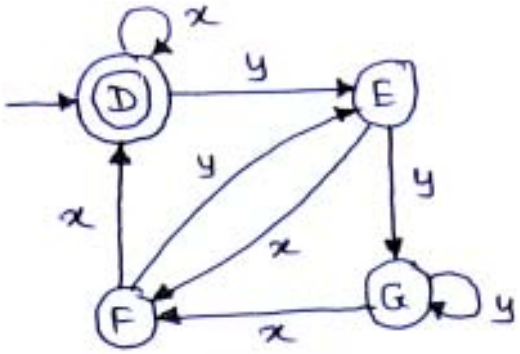
P.T.O.

2. a) Design an FSM for divisibility by 3 tester for a unary number. **6**

   b) Find out whether M1 and M2 are equivalent. **6**



(M1)



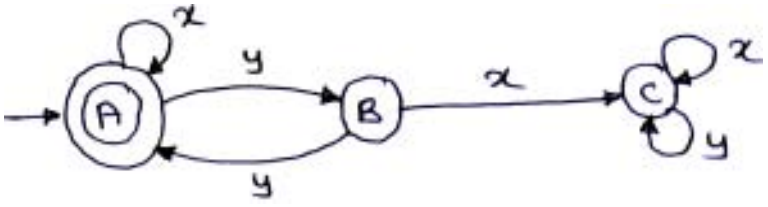
(M2)

   c) Construct DFA equivalent to NFA ({p, q, r, s}, {θ, 1}, δ, p, {s}). **6**

δ =

	θ	1
p	p, q	p
q	r	r
r	s	–
s	s	s

3. a) Construct regular expression for following transition diagram : **6**

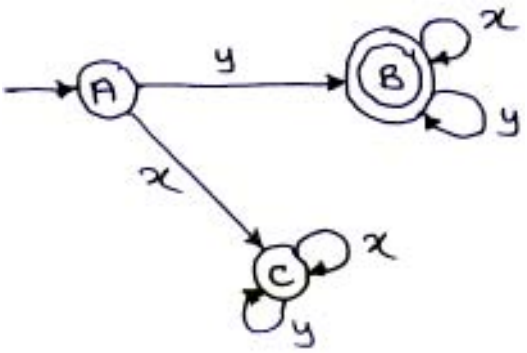


   b) Construct DFA for following regular expression (RE)
   RE = (a + b) * a b b. **6**

   c) Write a regular expression to identify valid decimal integer constant for 'C' language. Justify RE with example. **4**

OR

4. a) Construct regular expression for following transition diagram. **6**



b) Construct DFA for following regular expression (RE)
RE = b (a + b)* a . **6**

c) Write a regular expression to search dat (.dat) file(s) having starting character "p" and ending with "zw". Justify RE with example(s). **4**

5. a) Convert the following grammar to Chomsky Normal Form (CNF). **6**

G = ({S, A, B}, {a, b, ∈ }, p, {S})

P = {S $\rightarrow$ ABA, A $\rightarrow$ aA, A $\rightarrow \in$

B $\rightarrow$ bB, B $\rightarrow \in$ }

[epsilon – ∈]

b) Construct the parse trees for the strings using specified derivation format for given grammar G. **6**

G = ({S, A, B}, {a, b}, P, {S})

P = {S $\rightarrow$ aB, S $\rightarrow$ bA,

A $\rightarrow$ a, A $\rightarrow$ aS, A $\rightarrow$ bAA,

B $\rightarrow$ b, B $\rightarrow$ bS, B $\rightarrow$ aBB}

Strings :

I) a a a b b b (leftmost derivation)

II) a b a b a b b a (rightmost derivation).

c) Convert right linear grammar to equivalent left linear grammar. **4**

G = ({S, A, B, C}, { θ , 1}, P, {S})

P = {S $\rightarrow$ θ A, S $\rightarrow$ 1B,

A $\rightarrow$ 1A, A $\rightarrow$ θ C, A $\rightarrow$ θ ,

B $\rightarrow$ 1A, B $\rightarrow$ 1B, B $\rightarrow$ 1,

C $\rightarrow$ θ A, C $\rightarrow$ θ }

OR

6. a) Convert the following grammar to Chomsky normal form (CNF). **6**

G = ({S}, {a}, P, {S})

P = {S $\rightarrow$ a a a a a S, S $\rightarrow$ a a a}

b) Construct the parse trees for the strings using specified derivation format for given grammar G **6**

G = ({S, A, B}, {a, b}, P, {S})

P = {S $\rightarrow$ aB, S $\rightarrow$ bA,

A $\rightarrow$ a, A $\rightarrow$ aS, A $\rightarrow$ bAA,

B $\rightarrow$ b, B $\rightarrow$ bS, B $\rightarrow$ aBB}

Strings :

I) a a a b b b (rightmost derivation)

II) a a b a b b (leftmost derivation)

c) Convert right linear grammar to equivalent left linear grammar. **4**

G = ({S, B, C}, {a, b}, P, {S})

P = {S $\rightarrow$ bB, B $\rightarrow$ bC, B $\rightarrow$ aB, B $\rightarrow$ b,

C $\rightarrow$ a}

SECTION – II

7. a) Construct a context free grammer G generating all integers (with sign). Derive an example integer. **4**

   b) If G is the grammar S $\rightarrow$ SbS|a, show that G is ambiguous. **4**

   c) State and prove pumping lemma theorem. **8**

OR

8. a) Write regular expressions for

   i) Set of strings of 0's and 1's whose tenth symbol from the right end is 1.

   ii) Set of strings of 0's and 1's not containing 101 as substring.

   iii) Set of strings with even number of a's followed by odd number of b's that is for the language. $L = \left\{ a^{2n} b^{2m+1} : n \geq 0, m \geq 0 \right\}$

   iv) Set of strings of an equal number of 0's and 1's such that in every prefix, the number of 0's differs from the number of 1's by at most 1. **8**

   b) Construct the regular expressions for the transition diagrams given. **8**

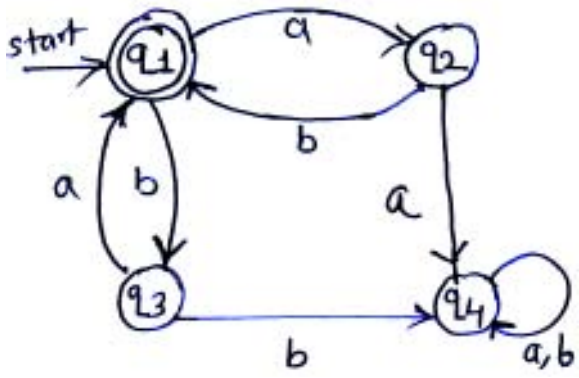


Fig. (i)

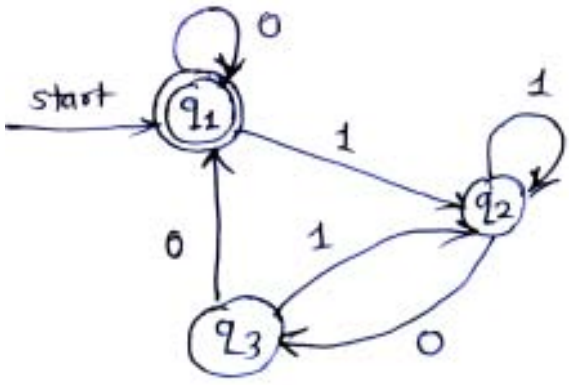


Fig. (ii)

9. a) Design a pushdown automata for the following language

$L = \{a^n b^{2n} : n > 0\}$. **8**

b) Design a PDA for the following CFG,

$G = (V_n , V_t, P, S)$ with

$V_n = \{S\}$, $\{V_t = \{(,)\}$ and P is defined as follows

$S \rightarrow \in$

$S \rightarrow SS$

$S \rightarrow (S)$. **8**

OR

10. a) Write a note on closure properties of CFLs. **6**

b) Write a note on write a note on post machines. **6**

c) Write definitions :

i) Deterministic PDA (DPDA)

ii) Non-deterministic PDA (NPDA). **4**

11. a) Design a turing machine that accepts the language of all strings which contain aba as a substring. **8**

b) Write a short note on Universal Turing Machine. **8**

c) What are ‘Multi-Tape TMs’? **2**

OR

12. a) Explain Chomsky Hierarchy and describe the machines that you have learnt in this course that accept each type of grammar of Chomsky Hierarchy. **8**

b) Explain the following : **10**

i) Limitations of finite Automata

ii) Recursive sets

iii) Partial Recursive functions

iv) Recursively enumerable sets

v) Limitations of TM.

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T.E. (Information Technology) (Semester – I) Examination, 2010
COMPUTER NETWORK TECHNOLOGY (New)
(2008 Course)

Time : 3 Hours Marks : 100

Instructions *:1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Black figures to the ***right*** *indicate* ***full*** *marks.*
4) Your answers will be valued as a ***whole****.*
5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Differentiate among circuit switching, packet switching and message switching with one example. **8**

   b) Explain Hub, Switch and Bridge with the help of suitable block diagram. **8**

   OR

2. a) Discuss the design issues of the network layer. **8**

   b) What are the different addresses used in an Internet using TCP/IP protocols ? Explain each in brief with example. **8**

3. a) Define Subnetting. **2**

   b) For a given class C network 195.188.65.0 design the equal subnets in such a way that each subnet has at least 50 nodes. **8**

   c) Explain connection oriented and connectionless services. **8**

   OR

4. a) Define Supernetting. **2**

   b) Explain flow control and congestion control in connection oriented service. **8**

   c) Consider any class - C network with default subnet mask. How many actual hosts can be connected in that network ? Divide that network into 4 equal subnets. What is the new subnet mask ? How many hosts can be connected in each subnet ? (Give all details). **8**

5. a) Explain three way hand shake algorithm for TCP connection establishment. **8**

   b) State and explain similarities and differences between data link layer and transport layer. **8**

OR

6. a) What is silly window syndrome ? How to overcome it ? **8**

   b) Explain dynamic buffer allocation at transport layer with suitable example. **8**

SECTION – II

7. Write **any 3** short notes on : **18**

   1) MIME

   2) Cookies

   3) RSV P

   4) Dynamic and Active pages.

OR

8. a) What is FTP ? Where and when it is used ? Why does it require 02 ports ? Explain at least 05 commands used in FTP. **10**

   b) Explain MIB along with its structure. **8**

9. a) What is the need of RTCP protocol along with RTP protocol in multimedia communication ? **8**

   b) Explain H. 323 architectural model and its protocol stack. **8**

OR

10. a) What is meant by interactivity of real time interactive audio/video ? **8**

    b) Compare between SIP and H. 323. **8**

11. a) What is cashing ? Who should do the cashing ? How long should pages be cashed ? **8**

    b) Explain email architecture and its services. **8**

OR

12. a) Explain Bluetooth architecture with diagram. **8**

    b) Discuss various layers used in ATM architecture. **8**

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T.E. (Printing) (Semester – I) Examination, 2010
OFFSET MACHINES – I
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **All** questions are **compulsory**.*

SECTION – I

1. Explain the following : **16**
   a) Bearer
   b) Undercut
   c) Pin Register Systems
   d) Transfer Squeeze
   e) Cylinder Gap
   f) Plate Clamp
   g) Cylinder Packing
   h) Bearer Clearance.

OR

1. Answer **any two** : **16**
   a) Explain types of Blanket and ideal requirement of offset Blanket.
   b) Explain types of Transfer Drum.
   c) Explain the Bearer contact and Bearer clearance.

2. a) Explain the manufacturing process of positive working P.S. Plate. **8**
   b) Explain the Thermal CTP technology in detail. **8**

OR

2. a) Explain the manufacturing process of negative working P.S. Plate. **8**
   b) Differentiate between conventional and CTP technology. **8**

P.T.O.

3. a) Explain the different ways by which metering system of sheet fed offset inking unit is carried out. **9**

   b) Explain the Multi Roller inking system with diagram. **9**

OR

3. a) Explain the multi roller inking system with a neat diagram. **9**

   b) State at least five functions of inking system. **4**

   c) Why the rollers in the inking system are of varying diameter ? **5**

SECTION – II

4. a) Explain the construction of dampening system for a sheet fed offset machine. **9**

   b) Explain the concept of metering in continuous flow dampening. **5**

   c) Explain advantages and disadvantages of IPA in fountain solution. **4**

OR

4. a) With help of diagram explain any two continuous Dampening system. **9**

   b) Explain the role of different constituents used in fountain solution. **9**

5. a) Draw a neat figure of Swing Arm Gripper and explain functioning. **8**

   b) Explain the role of side and front lay in sheet fed machine. **8**

OR

5. a) Explain the role of following : **8**
   1) Pile Height Governor
   2) Suckers and blowers.

   b) Why the operator positions the sheet on off centre on the pile table ? **4**

   c) Explain the concept of IR drying in sheet fed offset. **4**

6. a) State the plan of press maintenance of a single color machine. Write a check list. **8**

   b) Explain any four types of waste generated in press room. **8**

OR

6. a) Explain various quality control aids used to evaluate the press performance. **8**

   b) What are the different make-ready operations performed on sheet fed machine ? **8**

[3863] – 463

T.E. (Printing) (Semester – I) Examination, 2010
COLOUR MANAGEMENT AND STANDARDIZATION
(2008 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. Answer **any two** : **18**

A) Explain the properties of process color cyan, magenta and yellow in terms of reflection and absorption.

B) Process colors cyan, magenta and yellow are used for printing instead of Red, Green and Blue. Explain this with reflection and absorption of color.

C) Explain the Electromagnetic spectrum.

2. Solve **any two** : **16**

A) Explain trichromancy and Opponency theory of human vision with neat diagram.

B) Explain the interaction of light with object in terms of transmission, absorption and scattering.

C) Explain **any two** :

1) Simultaneous contrast

2) Chromatic adaption

3) CIE Standard Illuminant

4) Metamerism.

3. Answer **any two** : **16**

A) Explain CIE xy Y Space with 4 advantages and 4 disadvantages.

B) Explain the Munsell color system.

C) Explain human matching function. Explain the color matching experiment used to define human matching function.

SECTION – II

4. Answer **any two** : **18**

A) Explain four instrumental geometries.

0/45, 45/0, d/8, 8/d

B) Explain the principle and construction of spectrophotometer.

C) Explain the color coordinates L, a, b, c, h.

5. Answer **any two** : **16**

A) Explain the 4 c's of color management

B) What are the different rendering intents used in colur management, explain with their application.

C) Solve **any two** of the following :

1) Device Independent workflow
2) Input profile and output profile
3) Need for color management.

6. Solve **any two** : **16**

A) Explain the following terms used for press standardization

1) Density
2) Dot gain
3) Gray balance.

B) Explain the workflow for press standardization for any process. Explain with example from pre press to press.

C) Explain quality control aids used for press standardization.

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[3863] – 465

T.E. (Printing) (Semester – I) Examination, 2010
DESIGN OF PRINTING MACHINE COMPONENTS
(2008 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the BIS system of designation of steel. **8**

   b) Explain types of fit using at least three examples. **8**

   OR

   a) State and explain the significance of service factor and overload factor. **8**

   b) Explain creativity in design and explain step by step procedure for design of shaft on basis of ASME code. **8**

2. a) It is required to design knuckle joint to connect two circular rod, subjected to an axial tensile force of 50 kN, Rods are co-axial and small amount of angular moment between their axis is permissible. Design the joint and specify the dimensions of its components, select suitable material for its parts. **8**

   b) Draw a neat sketch of cotter joint and also explain design of cotter joint. **8**

   OR

   a) Explain step by step procedure of knuckle joint. **8**

   b) Explain the term F.O.S. and factors to be considered while selecting factor of safety. **8**

3. a) Two 35 mm shaft of printing machine are connected by a flange coupling, the flanges are fitted with 6 bolts on 125 mm bolt circle, the shaft transmit a torque of 800 N-m at 350 rpm for the safe stresses mentioned below,
      i) Calculate diameter of bolt
      ii) Thickness of flanges
      iii) Key dimensions
      iv) Hub length and
      v) Power transmitted. **18**

   OR

   a) Explain ASME code procedure of design of shaft. **10**

   b) Explain the important factor in selecting a coupling. **8**

P.T.O.

SECTION – II

4. a) What are the different types of stresses induced in power screw ? **6**

   b) Derive the relation for torque required to raise load on a square threaded screw. **10**

OR

   a) Explain construction and applications of recirculating ball screw. **8**

   b) A double threaded power screw with ISO metric trapezoidal and ASME code is used to raise the load of 300 kN. Nominal diameter 100 mm and pitch is 12 mm coefficient of friction at screw thread 0.15 reflecting collar friction. Calculate friction torque to raise the load, lower the load and efficiency for trapezoidal and ASME. **8**

5. a) A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find the maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 MPa. **8**

   b) Explain advantages and limitations of welded joint. **8**

OR

   a) Explain the basic types of screw fastening. **8**

   b) What are the different types of stresses including in screw threads ? **8**

6. a) Derive the relation for deflection of helical torsion spring. **8**

   b) A mechanism used in printing machinery consist of a tension spring assembled with a preload of 30 N. The wire diameter of spring is 2 mm with a spring index of 6. The spring has 18 active coils. The spring wire is not drawn and oil tempered having following material properties.

      1) Design shear stress = 680 N/mm^2
      2) Modulus of rigidity = 8×10^4 N/mm^2

      Determine :

      1) The initial shear stress in the wire
      2) The spring rate and
      3) The maximum force the spring can take. **10**

OR

   a) Write a short note on **(any three)** : **18**

      i) load stress equation for helical spring
      ii) Spring nomenclature
      iii) load-deflection derivation
      iv) Types of spring.

[3863] – 472

T.E. (Biotechnology) (Semester - I) Examination, 2010
MASS TRANSFER
2008 Course

Time : 3 Hours Max. Marks : 100

Instructions *:1) Answer* ***any three*** *questions from Section* ***I*** *and* ***any three*** *from Section* ***II.***
2) Figures to the right indicate ***full*** *marks.*
3) Make suitable assumptions ***wherever necessary.***
4) Draw neat sketches ***wherever*** *required.*
5) Use of ***programmable*** *calculator is* ***not*** *allowed.*

SECTION – I

1. a) Give a detailed note on Mass, Heat and Momentum transfer analogies. **6**

   b) A tube of small diameter is filled with acetone (density = 0.79 gm/cc) up to 1.10 cm from top and maintained at a temperature of 20^0C in a gentle current of air. After 5 hours the level of liquid fell to 2.05 cms from the top. Calculate the diffusivity of acetone in air if the barometric pressure was 750 mm Hg. Vapor pressure of acetone at 20°C is 180 mm Hg. R=82.06 cc atm/gm-mol °K. **10**

OR

2. a) Discuss in brief the design principles to be considered while selecting any mass transfer operation. **8**

   b) At 20°C the solubility of ammonia in water is given by P = 0.0216 C, where P is in atm and C is in Kg/m^3. A mixture of 10% ammonia and 90% of air by volume at 1 atm is in contact with an aqueous solution containing 2.5 gms ammonia per liter. The air velocity is such that $k_G/k_L = 1$. Find the concentration of ammonia and partial pressure of ammonia at the interface. **8**

3. a) Define the following terms: **6**
      i. Distillation
      ii. Relative volatility
      iii. Constant temperature equilibria.

   b) Give short notes on Vapor liquid equilibrium for non ideal systems. **10**

OR

4. a) Explain with a neat sketch low pressure distillation. **8**

   b) Define flash distillation. Derive the operating line equation for the same. **8**

5. a) Define the following : **6**

      i. Murphree tray efficiency

      ii. Overall tray efficiency

      iii. Point efficiency

   b) A feed of 50 mole% benzene and the remaining toluene is sent into a flash disengaging chamber. The outlet leaving streams are assumed to be in equilibrium. If the fraction of feed converted into vapor is 0.5, find the compositions of distillate and residue. Equilibrium data is given as : **12**

x	1	0.69	0.4	0.192	0.045	0
y	1	0.932	0.78	0.538	0.1775	0

OR

6. A binary mixture of methanol (30% by weight) and ethanol (70% by weight) is to be seperated by fractionation to obtain each of 95% purity by weight. Calculate the minimum reflux and the number of ideal plates at total reflux if the feed is 30% vaporized. Also calculate the actual number of plates if a reflux ratio of twice the minimum is used when he overall plate efficiency is 60%. The system follows Raoult's law. The following vapor pressure data is available. **8**

Temperature, ^{0}C	64	67	70	73	76	78
Methanol, mm Hg	760	820	920	1020	1150	1260
Ethanol, mm Hg	420	430	470	610	690	760

SECTION – II

7. a) Discuss in detail : **8**

   i) Absorption factor.

   ii) L/G ratios for absorbers.

   b) A gas absorber has to be designed to handle 900 cubic meters per hour of coal gas containing 2% by volume benzene. Coal gas enters at a temperature of 300° K and 805mm Hg. 95% of benzene is to be recovered by the solvent. The solvent enters at 300° K containing 0.005 mole fraction of benzene and has an average molecular weight of 260. Calculate the circulation rate of solvent per second if the column is to be operated at 1.5 times minimum L_S. Equilibrium data is given **8**
   $Y/(1+Y) = 0.125X/(1+X)$, where Y and X are in mole ratio terms.

OR

8. a) A packed tower is designed to recover 98% CO_2 from a gas mixture containing 10% CO_2 and 90% air using water. A relation y = 14x can be used for equilibrium conditions where y and x are in mass ratios. The water to gas rate is kept 30% more than the minimum value. Calculate the height of the tower if $(HTU)_{OG}$ is 1metre. **8**

   b) Define gas absorption with a suitable example. Explain the mechanism of gas absorption by taking equilibrium condition into account. **8**

9. a) Classify drying equipment. List out the advantages of continuous drying equipment over batch drying equipment. **4**

   b) Explain the equilibrium moisture curve with a neat sketch. **6**

   c) Explain with a neat sketch Pneumatic flash dryer. What are its applications ? **6**

OR

10. a) A certain material was dried under constant drying conditions and it was found that 2 hours are required to reduce the free moisture content from 20% to 10%. How much longer would be required to reduce the free moisture to 4% ? Assume that no constant rate period is encountered. **16**

11. a) Classify crystallization equipment. Explain the construction and working of Krystal crystallizers with a neat sketch. **10**

    b) Write a short note on : **8**

        i) Yield of Crystallization process.

        ii) Mechanism of Crystallization.

OR

12. A hot solution containing 5000 Kg of Na_2CO_3 and water with a concentration of 25% by weight Na_2CO_3 is cooled to 293°K and crystals of Na_2CO_3. 10 H_2O are precipitated. At 293°K the solubility is 21.5 Kg anhydrous Na_2CO_3/100Kg of water. Calculate the yeild of Na_2CO_3 crystals obtained if 5% of the original water in the system evaporates on cooling. **18**

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T.E. (Biotechnology) Examination, 2010
HEAT TRANSFER
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

*ii) Answers to the **two** Sections should be written in **separate** answer books.*

*iii) **Neat** diagrams must be drawn **whenever** necessary.*

*iv) Assume suitable data, if **necessary**.*

*v) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is **allowed**.*

*vi) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) It is desired to correlate the experimental data obtained for convection heat transfer coefficient for flow of fluid through a tube. Apply the Buckingham π – theorem and develop a relation among the pertinent dimensionless groups to correlate the data. **10**

1. b) What is the "Principle of Similarity" ? **2**

1. c) Explain the importance of dimensional analysis in data reduction and data analysis. **4**

OR

2. a) Explain the laws involved in 'Conduction' and 'Convection'. **6**

2. b) Find the dimensions of the following physical quantities in terms of the four basic dimensions :

i) Heat Transfer Coefficient

ii) Thermal Conductivity

iii) Specific Heat. **10**

P.T.O.

3. a) Asbestos insulation (k = 0.20 W/m-K) is put on a steel pipe (1.6 cm I.D., 2 cm O.D.). Hot water at 90°C flows through the pipe and the heat transfer coefficient (hi) is 500 W/m^2-K. Heat is lost from the outer surface by natural convection to surrounding air at 30°C and the heat transfer coefficient (hi) is 10 W/m^2-K. Calculate the heat loss rate per meter length of the pipe for insulation thicknesses of 0, 0.5, 1, 2, 3, 4 and 5 cm. Plot the results and discuss the variation obtained. **10**

3. b) In a composite slab, show that the rate of heat flows through the slab can be calculated as the ratio of the overall temperature drop to the overall resistance of the wall. **8**

OR

4. a) In an infinitely long solid cylinder of radius 'R', heat is being generated at a uniform rate of 'q' units per unit volume. The heat transfer coefficient at the surface is 'h' and the ambient temperature is 'T_f'. Find the steady state temperature distribution in the infinitely long solid cylinder. **8**

4. b) What is meant by 'Thermal Contact Resistance' ? Upon what parameters does this resistance depend ? **4**

4. c) A plane wall is fitted with an aluminum (k = 204 W/m-K) pin fin of 1 cm diameter and 30 cm length. The fin base temperature is 300°C and the pin fin is in contact with air at 30°C. The convection heat transfer coefficient between the fin surface and air is 10 W/m^2-K. Assuming that the fin is infinitely long, calculate the temperature at 5 cm, 15 cm, and 25 cm from the base and the rate of heat transfer from the fin. **6**

5. a) What are the types of condensation ? Explain in detail. **6**

5. b) Distinguish between natural and forced convection. **4**

5. c) Give the physical significance of Prandtl number with respect to thermal boundary layer. **6**

OR

6. a) Derive the differential equation of heat convection in Cartesian coordinates for the steady two dimensional flow of a constant property fluid. **10**

6. b) Write a note on 'Heat transfer to boiling liquids'. **6**

SECTION – II

7. a) Calculate the net exchange of radiant heat flux between two infinite parallel diffuse gray surfaces which are maintained at absolute temperatures T_1 and T_2 and have emissivities ε_1 and ε_2. **10**

7. b) Explain the 'Laws of black body radiation'. **6**

OR

8. a) Suppose a sphere of surface area A_1 is completely enclosed by an irregular surface of area A_2. Determine the shape factors F_{12}, F_{21}, F_{11} and F_{22}. **6**

8. b) How does regular or specular reflection differ from diffuse reflection ? **6**

8. c) Define and explain the following terms : **4**

i) Emissive power and ii) Black Body.

9. a) Derive an expression for the mean temperature difference in a parallel flow heat exchanger in which inlet and exit temperature on the hot side are T_{hi} and T_{he} and on the cold side are T_{ci} and T_{ce}, respectively. **6**

9. a) Explain the following types of heat exchangers with neat sketch. **12**

i) Double pipe heat exchanger

ii) 1-2 Shell and Tube heat exchanger

iii) Cross flow heat exchanger

iv) Compact hear exchanger.

OR

10. a) Water at the rate of 68 kg/min is heated from 35°C to 75°C by an oil having a specific heat of 1.9 kJ/kg °C. The fluids are used in a counter flow double pipe heat exchanger, and the oil enters the exchanger at 110°C and leaves at 75°C. The overall heat transfer coefficient is 320 W/m^2 °C. Using the same entering fluid temperature, calculate the exit water temperature when only 40 kg/min of water is heated but the same quantity of oil is used. Also calculate the heat transfer under these new conditions.
For NTU = 1.816 and C_{min}/C_{max} = 0.515; $\varepsilon = 0.744$. **8**

10. b) Define 'effectiveness' and discuss its physical significance. Also, derive the equation for the same for parallel flow. **10**

11. a) What are the liquid characteristics important in evaporation ? **8**

11. b) An evaporator is to be fed with 5000 kg/h of solution containing 10% solute by weight. The feed at 40°C is to be concentrated to a solution containing 40% by weight of the solute under an absolute pressure of 1.03 kg/cm^2. Steam is available at an absolute pressure of 3 atm (saturation temperature of 134°C). The overall heat transfer coefficient is 1500 kcal/hr m^2°C. Calculate : **8**

i) Heat transfer area that should be provided

ii) The steam requirement.

Treat the solutions as pure water for purposes of enthalpy calculations.

Data :

Temperature, °C	**Enthalpy, kcal/kg**	
	Vapor	**Liquid**
40	613.5	40.5
100	639.2	100
134	651.4	134.4

OR

12. a) Explain ‘feedforward’ and ‘backward’ feeding methods in multiple effect evaporators. **6**

12. b) Discuss with neat sketch working of circulation and falling film evaporators. **6**

12. c) Define ‘capacity’ and ‘economy’ of an evaporator. Show the relation between them. **4**

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T.E. Biotechnology (Semester – I) Examination, 2010
FERMENTATION TECHNOLOGY-I
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer books.*
*iii) **Neat** diagrams should be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*

SECTION – I

1. The Plackett-Burman experimental design matrix for screening of medium components for Amylase production by *Bacilus subtilis* is given below. In this experiment X_8, X_9, X_{10}, X_{11} are dummy variables. Find out the variables having maximum effect on production of Amylase. **18**

Trial	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	Enzyme activity (mcg/ml)
1	+	+	–	+	+	+	–	–	–	+	–	0.423
2	–	+	+	–	+	+	+	–	–	–	+	0.245
3	+	–	+	+	–	+	+	+	–	–	–	0.284
4	–	+	–	+	+	–	+	+	+	–	–	0.261
5	–	–	+	–	+	+	–	+	+	+	–	0.164
6	–	–	–	+	–	+	+	–	+	+	+	0.125
7	+	–	–	–	+	–	+	+	–	+	+	0.437
8	+	+	–	–	–	+	–	+	+	–	+	0.409
9	+	+	+	–	–	–	+	–	+	+	–	0.384
10	–	+	+	+	–	–	–	+	–	+	+	0.157
11	+	–	+	+	+	–	–	–	+	–	+	0.336
12	–	–	–	–	–	–	–	–	–	–	–	0.144

OR

2. Explain in detail various steps involved in Upstream processing. **18**

P.T.O.

3. a) Write the sources of nutrients in a media that can be used to obtain maximum growth of desired micro-organisms. **10**

   b) Explain the Fed batch mode of operation. How Fed batch mode is better than a batch mode when growth limiting substance is a part of media ? **6**

OR

4. Write in detail microbial fermentation of Citric or Lactic acid along with the downstream processing. **16**

5. a) Along with various preservation techniques, explain the most economical method of preservation of an industrially important microorganisms. **12**

   b) How Heterofermentative lactic acid bacteria differs from the homofermentative bacteria ? Explain with example. **4**

OR

6. a) Write in detail various strategies adopted for industrial production of ethanol. **12**

   b) Explain the applications of Vinegar. **4**

SECTION – II

7. Explain in detail production of vitamin B 12. **18**

OR

8. Write various methods that can be used for immobilization of yeast cells. Explain one method in detail along with its advantages. **18**

9. a) Write in detail fermentation process involved in production of Penicillin. **10**

   b) What is submerged fermentation ? Enlist its advantages and disadvantages. **6**

OR

10. a) Explain in detail cephalosporin production. **10**

    b) Enlist various bioreactors used in Solid state fermentation. What are advantages and disadvantages of stirred tank reactor ? **6**

11. a) Explain various terms involved in fermentation economics with suitable example. **10**

    b) Write in detail various strategies adopted to purify a product formed after fermentation process. **6**

OR

12. Enlist the fermentors used for animal cell culture. Explain in detail working of Airlift bioreactor along with its types, advantages and applications. **16**

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T.E. (Biotechnology) (Semester – I) Examination, 2010
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from Section **I** and **any three** from Section **II**.*
*2) Figures to the **right** indicate **full** marks.*
*3) Make suitable assumptions **wherever** necessary.*

SECTION – I

1. a) Determine the constants "a" and "b" by the least squares method such that $y = ae^{bx}$ fits the following data. **8**

x	1	1.2	1.4	1.6
y	40.170	73.196	133.372	243.02

b) Find the values of "a", "b" and "c" so that $Y = a+bx+cx^2$ is the best fit to the data. **8**

x	0	1	2	3	4
y	1	0	3	10	21

OR

2. a) The following are the results of an experiment on friction of bearings, the speed being constant. Corresponding values of coefficient of friction and temperature are shown in the table. If μ and t are given by the law find the values of "a" and "b". **8**

t	120	110	100	90	80	70
μ	0.0051	0.0059	0.0071	0.0085	0.00102	0.00124

b) Fit a least square geometric curve of the form $y = ax^b$ to the data. **8**

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

P.T.O.

3. a) Applying Lagrange's formula and find a polynomial which approximates the following data. **10**

x	–2	–1	2	3
f(x)	–12	–8	3	5

b) $\Delta^2(x^3)$. Evaluate It. **6**

OR

4. a) Given the set of tabulated points (1, –3), (3, 9), (4, 30) and (6, 132). Obtain the value of y when x is 2 using Newton's divided difference formulae. **8**

b) The population of a town in decennial census was as under. Estimate the population for the year 1955 using Newton's interpolation formulae. **8**

Year	1921	1931	1941	1951	1961
Population (in thousands)	46	66	81	93	101

5. a) The velocities of a car running on a straight rod at intervals of two minutes are given below. **9**

Time (min.)	0	2	4	6	8	10	12
Velocity (km/hr)	0	22	30	27	18	7	0

Apply Simpson's 1/3rd rule to find the total distance covered by the car. Compare with the actual value.

b) Determine the maximum error in evaluating the integral $\int$ cosxdx from 0 to $\pi/2$ by trapezoidal rule using four sub intervals. **9**

OR

6. a) A curve is drawn to pass through the points given by the following table. Using Weddle's rule, estimate the area bounded by the curve, the x-axis and the lines x =1 and x = 4. **9**

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

b) A reservoir discharging water through sluices at a depth "h" below the water surface has a surface area "A" for various values of "h" as given below. If "t" denotes the time in minutes, the rate of fall of the surface is given by dh/dt = – (48h/A). Estimate the time taken for the water level to fall from 14 to 10 ft above the sluices. **9**

h (ft)	10	11	12	13	14
A (sq.ft)	950	1070	1200	1350	1530

SECTION – II

7. a) Find the least positive root of the equation tanx = x to an accuracy of 0.001 by Newton-Raphson method. **8**

   b) Find the root of the equation 2x = cos x + 3 correct to three decimal places by Bisection method. **8**

OR

8. a) Use the method of Regular falsi to estimate the positive root of the equation $xe^x = 1$ between 0 and 1. **8**

   b) Find the real root of the non linear equations $x^2 – y^2 = 3$ and $x^2+y^2 = 13$ by Newton-Raphson method. **8**

9. a) What are the essentials of sampling ? **6**

   b) Discuss in short about types of bar diagrams. **10**

OR

10. a) Discuss in detail the methods of Sampling. **8**

    b) Discuss in detail on Pictographs and Cartograms with suitable examples. **8**

11. a) A controlled experiment was conducted to test the effectiveness of a new drug. Under this experiment 300 patients were treated with new drug and 200 were not treated with drug. The results of the experiment are as follows. Use Chi square test and comment on the effectiveness of the drug. For degrees of freedom = 2, the table value at 5% significance level is 5.49. **9**

Details	Cured	Condition worsened	No effect
Treated with drug	200	40	60
Not treated with drug	120	30	50

   b) The following table gives the yearly medical expenditure of 80 hostilities of a college. Calculate arithmetic mean, standard deviation and coefficient of

variation of the above data. **9**

Expenditure (Rs.)	78-82	73-77	68-72	63-67	58-62	53-57	48-52	43-47	38-42	33-37
No of students	2	6	7	12	18	13	9	7	4	2

OR

12. a) Calculate the median for the following data. **9**

Weight (gms)	410-419	420-429	430-439	440-449	450-459	460-469	470-479
No.of apples	14	20	42	54	45	18	7

b) Two laboratories "A" and "B" carry out independent estimates of fat content in ice cream made by a firm. A sample is taken from each batch, halved and the separated halves sent to two laboratories. The fat content obtained by the laboratories are recorded below. Is there a significant difference between the mean fat content obtained by the two laboratories "A" and "B" ? The following "t" extracts are given below. **9**

Degrees of freedom	6	7	8	9	10	16	18	20
5% value of t	1.45	2.36	2.31	2.26	2.23	2.12	2.10	2.09

Batch No.	1	2	3	4	5	6	7	8	9	10
Lab A	7	8	7	3	8	6	9	4	7	8
Lab B	9	8	8	4	7	7	9	6	6	6

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