UNIVERSITY OF PUNE

[4362]-113

S. E. (Mech/Mech SW/ Auto) Examination – May 2013

Fluid Mechanics

(2008 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**

[Time : 3 Hours] **[Max. Marks : 100]**

*(1) Answer **any three** questions from each section.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Your answer will be valued as a whole.
(5) Assume suitable data, if necessary.

SECTION -1

Q. 1 a) What is the fluid? What are different types of fluid? Explain. (6)

b) State and Explain the Newton's law of viscosity? (4)

c) A shaft of 150 mm diameter moves in a sleeve of length 300 mm at a speed of 0.5 m/s under the applications of 200 N force in the directions of its motions. If the clearance between the shaft and sleeves is 0.08 mm, Calculate in viscosity of the lubricating oil in the gap if the applied force is increased to 1000 N, what will be the speed of the sleeve? (8)

OR

Q. 2. a) What is surface tension? Derive equation of intensity of pressure for . (6)
1)Droplet 2)Bubble 3)Liquid jet

b) Differentiate between path line, streakline and streamline. (6)

c) If $v=(10x^2y)i+(15xy)j+(25t-3xy)k$, find acceleration of a fluid particle at (1,2,-1) and t = 0.5.
(6)

Q. 3 a) Derive an expression for total pressure and center of pressure for and inclined plane surface, immersed in static mass of a liquid. (6)

b) State and explain the Archimedes's principle. (4)

c) Explain with neat sketches, the condition of equilibrium for floating and submerged bodies. (6)

OR

Q. 4. a) State and explain Pascal's law. (2)

b) Prove that the center of the pressure of a plane surface is always below the center of gravity when immersed in liquid. (6)

c) A wooden block 60cm long, 25cm wide and 20cm deep has its shorter axis vertical with the depth of immersion 10cm. Calculate the position of the metacentre and comment on the stability of the block. (8)

Q. 5 a) Derive Euler's equations of motions along a streamline and further derive Bernoulli's equation From that. (8)

b) Describe a venturimeter and find an expression for measuring discharge of fluid through a pipe with this device. (8)

OR

Q. 6. a) What is pitot tube? How is it used? (6)

b) What is the notch? Find an expression for measuring the discharge of fluid across a triangular notch. (4)

c) With the help of a neat sketch, explain the working of an Orificemeter (6)

SECTION -2

Q. 7. a Derive Hagen-Poiseuille equation for steady uniform laminar flow through circular pipe. (8)

b Show that Pressure drop Δp of a flowing fluid through a pipe can expressed in the from: (8)

$$\Delta p = \rho V^2 \emptyset ¿ \; L/D \;,\; \mu/\rho VD, \; H/D ¿$$

OR

Q. 8. a) Explain Froude model law and Weber model law. (4)

b) A pipe 60 mm diameter and 450 m long slopes upwards at 1 in 50. An oil of viscosity 0.9 Ns/m^2 and specific gravity 0.9 is required to be pumped at the rate of 5 lps.

(12)

1) Is the flow laminar? 2) What is the power of the pump required assuming an overall efficiency Of 65% 3) What is the center line velocity and velocity gradient at pipe wall?

Q. 9. a) Derive the expression for loss of head due to sudden contraction. (8)

b) When a sudden contraction in introduced in a horizontal pipeline from 500mm diameter to 250mm diameter, the pressure changes from 105 kN/ m^2 to 69 kN/ m^2 . If the co-efficient of contraction is assumed to be 0.65, Calculate the water flow rate. Instead of this if sudden expansion is introduce of same size and if the pressure at the 250 mm section is 69 kN/ m^2 , What is the pressure at the 500 mm enlarge portion?
(10)

OR

Q. 10. a) Sketch Moody chart and explain how it is to be used? (6)

b) Two sharp ended pipes of diameters of 50 mm and 100 mm respectively, each of length 100m are connected in parallel between two reservoirs which have a difference of laver of 10m. If the friction factor for each pipe is 0.32, calculate:

1) Rate of flow for each pipe and 2) The diameter of a single pipe 100m long which would give the same discharge, if it were substituted for the original two pipes. (12)

Q.11. a) Explain briefly Boundary layer thickness with different types? (8)

b) Find power required to overcome boundary friction to cruise a passenger ship of 300m length and 12 m draft at 40 km/h. If $\rho = 1030 \text{kg}/m^3$ and $y = 1 \times 10^{-6}$ $m^2/s.$
(8)

OR

Q. 12. a) Prove the coefficient of lift of an aerofoil body depend on angle of attack (6)

b) A sphere of 4 cm diameter made of Aluminum (sp.gr. = 2.8) is attached to a string and suspended from the roof of a wind tunnel. If an air stream of 30m/s flows past the sphere, Find the inclination of the string and tension in the string.

$$If\ \Re > 3 \times 10^{5}$$

$\rho = 1.2 \text{kg}/m^3, y = 1.5 \times 12^{-5} m^2/s, CD = 0.5 (if\ 10^4 < \Re < 3 \times 10^5), CD = 0.2$ ¿

(10)

UNIVERSITY OF PUNE

S.E(Mech. S/W/ Mechanical/ Automobile) Examination,2013

METALLURGY

(2008 pattern)

Time-Three hours **Maximum Marks-100**

Total No. of Question=12 **[Total no. of printed pages= 3]**

Note:

(1)Answer any three questions from each Section.
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagram must be drawn necessary.
(4)Figures to the right indicate full marks.
(5)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a) Copper is more ductile than iron. Do you agree ?Justify your Choice. (4)
(b)Explain work hardening or strain hardening with curve (4)
(c)Why annealing is done after cold working ?Explain the change in mechanical properties that takes place during the stages of annealing with proper graph. (6)
(d) Explain how deformation twinning differs from slip. (4)

OR

Q.2 (a) Give the classification of crystal imperfections. Explain with neat sketches Planer defects. (6)
(b) Explain polygonization , recrystalization and grain growth. (6)
(c) Differentiate between the following (any two) (6)
(i)B.C.C. And H.C.P. Crystal System
(ii)Edge dislocation and Screw dislocation
(iii)Cold working and hot working.

Q.3 (a) Draw self explanatory sketches of the following(any four) (8)
(i)ductile and Brittle fractures.
(ii)Engineering and True Stress-Strain Curves
(iii)Specimen fixing arrangement in Charpy and Izod Impact Tests.
(iv)SN Curves for steel and aluminium.
(v)Fatigue fractures and Creep fracture.
(vi)Poldi Hardness Test Instrument.
(b)Explain the following NDT: (6)
(i)X-Ray Radiography (ii)Eddy Current Testing
(c)Define Endurance Limit. (2)

OR

Q.4 (a)Explain why breaking strength is lower than ultimate tensile strength in ductile materials.Derive the relation between engineering and true stress-strain values. (4)

(b)Suggest suitable hardness testing method for (4)

(i)Gray Cast Iron
(ii)Gold Plated Surface
(iii)Synthetic Rubber
(iv)Crank Shaft

(c)Why magna flux method is used in both the longitudinal and transverse directions for testing components? (4)

(d)What is creep?In which application should it be considered ?How the creep resistance is improved? (4)

Q.5 (a)What is critical temperature?What do you understand by A_0 A_1 A_2 A_3 and Acm? (4)

(b)Explain the classification of Steel: (4)

(i)On the basis of carbon content.
(ii)On the basis of de-oxidation.

(c)What is the alloy steel?What are the effects of alloying elements?(any two elements) (4)

(d)Draw Iron Carbon Equilibrium diagram ,and show critical temperatures and various phases on it. (4)

OR

Q.6 (a)Write short note on:(ant two) (8)

(i)HSLA
(ii)Dual Phase Steels
(iii)Tool Steels

(b)Why are the cast irons preferred to steels for certain applications?/Explain with specific examples. (4)

(c)Compare and contrast between austenitic and martensitic stainless steels. (4)

SECTION-II

Q.7(a)Draw TTT diagram for 0.8% C.What information is obtained from this diagram with respect to annealing,normalizing and hardening treatments? (8)

(b)Explain the following;(any Three) (6)

(i)Critical Cooling Rate.
(ii)Retained Austenite
(iii)Windmanstatten Structures
(iv)Cryogenic treatment

(c)Differentiate between Carburizing and Nitriding. (4)

OR

Q.8(a)Represent martempering ,austempering,patenting and ausforming on TTT diagram.State clearly what is the transformation product separately after each treatment. (6)

(b)What is the hardenability?How it is measured?Explain in detail. (6)

(c)What is the tempering of steels?Why are hardened steels tempered?Explain the changes in properties that occur during tempering? (4)

(d)Explain the principle of Induction Hardening. (2)

Q.9(a)Draw microstructures and give one application of: (6)

(i)White cast iron
(ii)Gray cast iron
(iii)S.G.Iron

(b)What are the advantages and limitations of Powder Metallurgy Process. (4)

(c)Explain the following characteristics of metal powder:(any three) (6)

(i)Apparent Density
(ii)Green Density
(iii)Green Strength
(iv)Green Spring

OR

Q.10(a)Enlist the types of brasses.Explain any one. (4)

(b)Describe the factors which control graphitization in cast iron. (4)

(c)What is the self lubricated bearing?What is their unique advantage over other bearing?Give their applications? (4)

(d)What is the importance of sintering. Can this step be omitted in powder Metallurgy. (4)

Q.11 (a)What is cemented carbide composite?How is it manufactured? (4)

(b)What do you understand from the following terms related to materials? (8)

(i)SAP (ii)Carbide Tool Bits
(iii)Alclad Sheet (iv)GRP

(c)What do you understand by the term glass?How does it differ from metals?(4)

OR

Q.12 (a) What are refractory materials?Give few examples of refractory materials. (4)

(b)Write short note:(any three) (12)

(i)Electrical contact materials
(ii)Ceramic materials
(iii)Role of design engineer and selection of advance materials
(iv)Special Cutting materials
(v)Super Alloys

UNIVERSITY OF PUNE
[4362-114]

S.E(Mech/Production/Mech SW/ Prod SW/ Auto) Examination,2013
Engineering Mathematics - III
(2008 pattern)

Time-Three hours Maximum Marks-100
Total No. of Question=12 [Total no. of printed pages= 5]

Note:

(1) In section I attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 in section II attempt Q7 or Q8, Q9 or Q10, Q11 or Q12.
(1)Use of elecronic poket calculator and steam table is allowed
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagram must be drawn necessary.
(4)Figures to the right indicate full marks.
(5)Assume suitable data wherever necessary.

SECTION-I

Q.1

(a)Solve any three. (12)

(i) $(D^2-6D+13)\,y=8e^{3x}\sin 4x+2^x$

(ii) $(D^4-m^4)\,y=sinmx$

(iii) $\frac{d^2y}{dx^2}+\frac{1}{x}\frac{dy}{dx}=\frac{12\log x}{x^2}$

(iv) $(D^2-3D+2)\,y=e^{e^x}$

(b)If $\frac{dx}{dt}-w\,y=a\cos pt$ (5)

$\frac{dy}{dt}+w\,x=a\sin pt$ show that

$$x=A\cos wt+B\sin wt+\frac{a}{p+w}\sin pt$$

$$y = B\cos wt - A\sin wt - \frac{a}{p+w}\cos pt$$

OR

Q.2 (a) Solve any Three (12)

(i) $(D^2 - 4D + 4)y = e^{2x} + x^3 + cos2x$

(ii) $(D^2 + 2D + 1)y = \frac{e^{-x}}{x+2}$

(iii) $(1+2x)^2\frac{d^2y}{dx^2} - 8(1+2x)\frac{dy}{dx} + 16y = 8(1+2x)^2$

(iv) $(D^2+4)y = \tan 2x$ (use variation of parameter method)

(b)Solve (5)

$$\frac{dx}{d^2 - yz} = \frac{dy}{y^2 - zx} = \frac{dz}{z^2 - xy}$$

Q. 3

(a) Find Laplace transform (any two) of the following functions. (6)

(i) $f(t) = \frac{e^{at} - e^{bt}}{t}$

(ii) $f(t) = sinht\ sint$

(iii) $f(t) = \int_0^t \frac{sint}{t}\,dt$

(b) Solve following equation by using Laplace transform . (5)

$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 12e^{-2t}, y(0) = 0$ and $y'(0) = 0$

(c) Solve the internal equation $\int_0^\infty f(x)\cos\lambda x\,dx = 1 - \lambda\ 0 \le \lambda \le 1$ (5)

$= 0 \quad x > 1$

OR

Q.4

(a) Find reverse Laplace transform(any two) (8)

(i) $\frac{1}{(S^2+4)^2}$ (ii) $\frac{S^2+2}{S(S^2+4)}$ (iii) $\cot^{-1}(S-1)$

(b)Evaluate by using Laplace transform (4)

$$\int_0^\infty \frac{e^{-at}-e^{-bt}}{t}dt$$

(c)Show that Fourier transform of (4)

$$f(x)=e^{-1x1} \text{ is } \frac{2}{1+\lambda^2}$$

Q.5

(a) A tightly streched string with fixed ends at x=o & x=l is initially in a position given by $y(x,0)=Y_0\sin^3(\frac{\pi x}{l})$ If it is released from this position find the displacement y at any distance x from one end at any time 't',if it satisfies the equation $\frac{\partial^2 y}{\partial} t^2=c^2\frac{\partial^2 y}{\partial x^2}$ (8)

(b)Solve $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}$ if (9)

(i)u(x,t) is bounded
(ii)u(0,t)=0
(iii)u(l,t)=0
(iv) $u(x,0)=\frac{u_0 x}{l} o\le x\le l$

OR

Q.6

(a) A rectangle plate with insulated surface is 10 cm wide and so long composed with width that it may be considered infinite in length,If the temperature along short edge y=o is given by u(x,0)=100 $\sin(\frac{\pi x}{10})$ $0\le x\le 10$ .while the two edges at x=0 & x=10 as well as the other short edge are kept at 0^0 C.Find steady state temperature u(x,y).if it satisfies $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ (9)

(b)Use fourier transform to solve (8)

$$\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2} \quad 0\le x\le\infty, t>0$$

(a)u(0,t)=0 t >0
(b)u(x,0)=1 0<x<1
=0 n>1
(c)u(x,t)is bounded

SECTION -II

Q.7
(a) Fluctuation in the Aggregate of marks obtained by two groups of students are given below .Find out which of the two shows greater variability. (6)

Group A	518	519	530	530	544	542	518	550	527	527	531	550	550	529	528
Group B	825	830	830	819	814	814	844	842	842	826	832	835	835	840	840

(b)For the following distribution ,find (6)
(i)First 4 moments about the A.M.
(ii)Coefficient of skewness and kurtosis
A=5, $\mu'_1=2, \mu'_2=20, \mu'_3=40$ and $\mu'_4=50,$
(c)In a Poisson distribution,if p(r=1)=2p(r=2),find p(r=3) (4)

OR

Q.8
(a)Given r=0.9, $\sum xy=70, 6y=3.5, \sum x^2=100$ find the number of item ,if x and y are derivations from arithmatic mean. (5)

(b)On an average a box containing 10 articles is likely to have 2 defectives,If are consider a consignment of 100 boxes, how many of them are expected to have three or len defective? (5)

(c)In a distribution ,exactly normal, 7 % of the items are under 35 and 89 % are under 63, Find the mean and standard deviation of the distribution.
$A_1=0.43, z_1=1.48, A_2=0.39, z_2=1.23$ (6)

Q.9
(a)Find the directional derivative of $\varphi=xy^2+yz^3$ at the point (1,-2,2)towards the point

(2,3,4) (6)

(b)With usual notation ,show that (6)

(i) $\nabla\times[\bar{a}\times(\bar{b}\times\bar{r})]=\bar{a}\times\bar{b}$

(ii) $\nabla[(\bar{r}\times\bar{a}).(\bar{r}\times\bar{b})]=\bar{b}\times(\bar{r}\times\bar{a})+\bar{a}\times(\bar{r}\times\bar{b})$

(c)Show that $\bar{F}=(6xy+z^3)\bar{i}+(3x^2-z)j+(3xz^2-y)\bar{k}$ is irrtational find scalar Φ such that $\bar{F}=\nabla\varphi$ (5)

OR

Q.10

(a) If $\bar{r}\times\frac{d\bar{r}}{dt}=0$ (6)

show that $\bar{r}$ has constant direction

(b)Show that the vector field $\bar{F}=f(r)\bar{r}$ is always irratational and determine f(r) such that the field is solential also (6)

(c)If the directional derivatives of $\phi=axy+byz+czx$ at (1,1,1) has maximum magnitude 4 in a direction parallel to y-axis,find the values of a,b,c. (5)

Q.11

(a)Find the work done in moving a particle from (0,1,-1) to $(\frac{\pi}{2},-1,2)$ in a force field.

$\bar{F}=(y^2\cos x+z^3)\bar{i}+(2y\sin x-4)\bar{j}+(3xz^2+2)\bar{k}$ (6)

(b)Using divergence theorem,evaluate

$\int\int_s(y^2z^2\bar{i}+z^2x^2\bar{j}+x^2y^2\bar{k})d\bar{s}$ where 's' is the upper part of the sphere $x^2+y^2+z^2=a^2$ above the plane z=0 . (6)

(c)Verify stokes Theorem for $\bar{F}=x^2\bar{i}+xy\bar{j}$ for the surface of a square lamine bounded by x=0,y=0,x=1,y=1 (5)

Q.12

(a)Using Green's theorem, show that the area bounded by a simple closed curve C is given by $\frac{1}{2}\int x\,dy - y\,dx$ Hence find the area of the circle $x = a\cos\theta,\ y = a\sin\theta$ (5)

(b)For $\bar{F} = 4\,xz\,\bar{i} + xy\,z^2\,\bar{j} + 3\,z\,\bar{k}$,evaluate $\int\int_s \bar{F}.d\,\bar{s}$ where s is the closed surface of a cone $z^2 = x^2 + y^2$ above the xoy plane and bounded by the plane z-4 (6)

(c)Evaluate $\int\int_s curl\,\bar{F}\,.\,\hat{n}\,.\,ds$ for the surface of a hemisphere $x^2 + y^2 + z^2 = a^2$ above the xoy plane,where $F = (x^2 + y - 4)\,\bar{i} + 3\mathrm{xy}\,\bar{j} + (2\mathrm{xz} + z^2)\,\bar{k}$ (6)

University of Pune
[4362]-118
S. E. Examination-2013
Mech/ Mech SW/ Auto
ELECTRICAL TECHNOLOGY
(2008 Pattern)

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **Q1 or Q2, Q3 or Q4 , Q5 or Q6** from section 1 and**Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II .*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of non-programmable pocket size scientific calculator is allowed.

(6) Assume suitable data, if necessary.

SECTION I

Q1 a) Show that in the two-wattmeter method of power measurement, the power consumed by a balanced 3-ph. Load with lagging power factor of 0.866 equals the sum of the two wattmeter readings. 6

b) What are requirements of a good lighting scheme? State two examples of special purpose lighting. 6

c) Explain use of CT and PT for measurement of power in single phase system with the help of neat sketch. 6

OR

Q2 a) Explain one wattmeter method for measurement of reactive power in three-phase circuit with the help of suitable sketch and phase or diagram. 6

b)What are objectives of Tariff? Explain TOD tariff. 6

c) The power in a 3-phase circuit is measured by two wattmeters. If the total power is 100 KW and power factor is 0.66 leading; what will be the reading of each wattmeter? For what p.f. will one of the wattmeter read zero? 6

Q3 a) Derive an expression for the torque developed by an induction motor under running conditions. Hence obtain the condition for maximum torque developed. 8

b) Discuss the role of various components of typical distribution transformer substation with the help of single line diagram. Also write the specifications of a distribution transformer. 8

OR

Q4 a) Discuss three phase transformer connections with the help of suitable diagrams. Comment on their possible applications. 8

b) The power input to the rotor of a 440V, 50Hz, 6-pole, 3-phase induction motor is 100 KW. The rotor electromotive force is observed to make 120 cycles per minute. Calculate: 8

i) rotor speed
ii) mechanical power developed
iii) rotor copper loss per phase
iv) rotor resistance per phase if rotor current is 60 A.

Q5 a) What is principle of working of split-phase induction motor? Explain the operation of capacitor start motor and state its applications. 8

b) Discuss the concept of synchronous reactance and synchronous impedance in case of an alternator on load. Draw and explain phasor diagram of a loaded alternator. 8

OR

Q6 a) Explain construction and working of shaded pole type induction motor with the help of suitable sketches. State its applications. 8

b) A 3-phase, 600 KVA alternator has a rated terminal voltage of 3300V. The stator winding is star-connected and has a resistance of 0.37 Ω/phase and a synchronous reactance of 4.3 Ω/phase. Calculate the voltage regulation for full load at a power factor of (i) unity and (ii) 0.8 lagging. 8

SECTION-II

Q7 a) Explain any two types of DC motors with the help of its circuit diagram and write their Voltage and Current relations. 6

b) Write short Note on 12

i) Stepper Motor
ii) A.C. Servo Motor

OR

Q8 a) A 250 Volts D.C. Shunt motor is running at a Speed of 1000 r.p.m. and drawing 8 amps. Current at NO LOAD. Motor armature resistance Ra=0.2 ohms and Field resistance Rsh=250ohms. Calculate the speed when motor is taking a Current of 51 amps. Assume constant flux. 6

b) Explain construction of D.C. motor with heat sketch. 6

c) Explain the significance of the name ‘Universal Motor’ and which motor can be developed as Universal motor some design changes and How? 6

Q9a) Enlist various turn ON methods of SCR and explain best suited method for operation. 6

b) Explain V-I characteristics of TRIAC 6

c) Draw the Symbols of i) SCR ii)DIAC iii)MOSFET iv)IGBT 4

OR

Q10 a) Explain the construction & working of MOSFET 6

b) Draw the V-I characteristics of SCR & show Holding Current, Latching Current and on state Voltage drop of SCR on it. 6

c) State applications of TRIAC and SCR 4

Q11a) Explain the need of constant V/F ratio in the speed control of Induction motor? 6

b) Explain the importance of speed torque characteristics in the section of the drive (give suitable examples) 6

c) State any four advantages of ELECTRICAL drives 4

OR

Q12 a) Explain single phase full converter Fed D.C. drive with suitable diagrams. 6

b) Write short note on Factors governing selection of the drives. 6

c) State working principle of frequency control of three phase induction motor 4

Total No. of Questions : 12 **[Total No. of Printed Pages :5]**

[4362]-119

S. E.(Mechanical) (Mechanical S/W)(Automobile) Examination -2012

STRENGTH OF MACHINE ELEMENT (2008 Pattern

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions:

1. *Answers to the **two sections** should be written in **separate answer-books**.*
2. *Neat diagrams must be drawn wherever necessary.*
3. *Assume suitable data, if necessary.*
4. *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
5. *Black figures to the right indicate full marks.*

Section I

1. a. Draw stress stains diagram for aluminium and for mild steel, clearly mention all point on the diagram (8)

   b. A bar ABCD is fixed at point A and D as shown Figure 1b. it is subjected to axial forces of 60 KN and 120 KN at point B and C respectively. The cross-sectional areas of AB, BC and CD are 1000mm^2 and 1500mm^2 and 2000 mm^2 respectively. Take E=200 GPa. Determine: (8)

   (i) Forces in the member AB, BC and CD

   (ii) Displacement of points B and C.

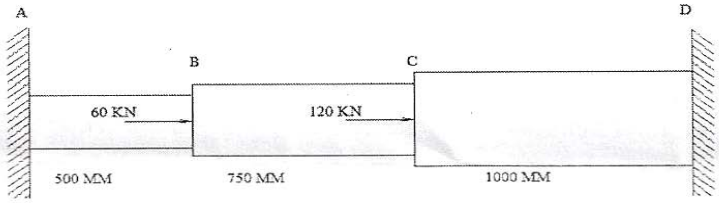


Figure 1b

OR

2 a. Two copper road and one steel rod(center) together support load be shown in figure 2a. Cross sectional area of each rod is 900 mm^2. If the stresses in copper steel are not to exceed 50 MPa and 100 MPa respectively find safe load can be supported Young's modules of the steel is twice that of copper. (8)

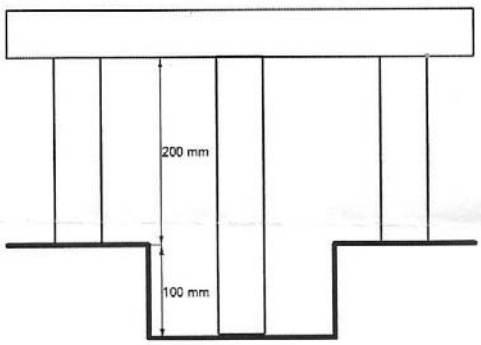


Figure 2a

b. a compound bar made of aluminium and steel subjected to a load of 200 kN is shown in figure 2b . The cross-sectional area of aluminium section is twice the steel section . If the elongation of the two section is equal, determine the length of each section (8)

Take E= 210 GPa for steel and E= 70 Gpa for aluminium .

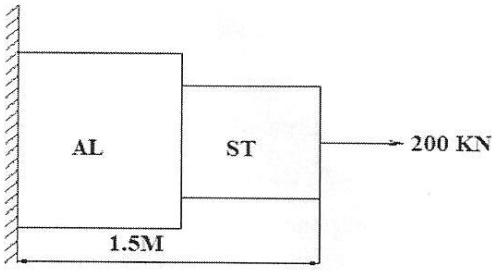


Fig. 2b

UNIT- II

3 .a A simply supported bean subjected to a uniformly distributed load and a clock wise couple is shown in figure 3a. Draw the shear force and bending moment Diagram. (8)

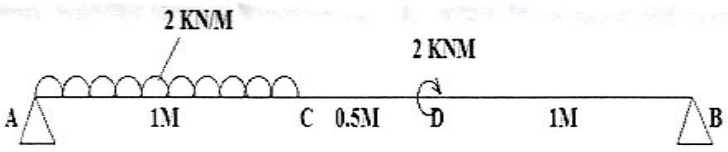


Figure 3a

b. The Share force diagram for a simple beam is shown in figure 3b. Determine the loading on the beam and draw the bending- movement diagram, assuming that no couple act as loads on the beam (8)

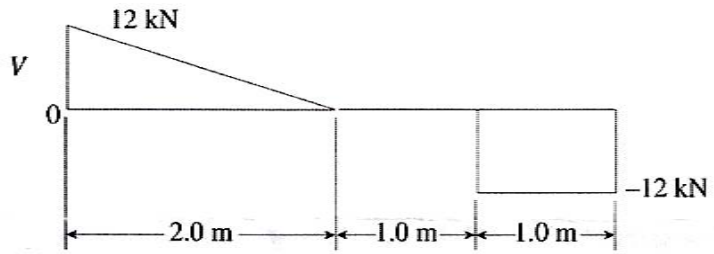


Figure 3b

OR

4 a. A simply supported beam with a span of 4.5 m carries a point load 30 kN at 3 meters from the left support. If for the section, Ixx = 5 x 10^{-6} m^4 and E =200 GPa , find (8)

(i) The defection under the load

(ii) The position and amount of maximum deflection

b. A beam of length 6 m is simply supported at it's ends and carries two point laods of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support find: 1. Deflection under each load 2. Maximum deflection 3. The point at which maximum deflection occurs.
(E= 2 x 10^5 N/mm^2 and I = 85 x $10^6 mm^4$) (8)

UNIT- III

5. a Derive the formula for normal stress and shear stress on an oblique plane which is inclined at an angle θ with the axis of minor stress. (8)

b. an element in a stressed material has tensile stress of 500 MPa and compressive stress of 350 MPa acting on two mutually perpendicular planes and equal shear stresses of 100 MPa on these planes(ccw). Find principal stresses and position of principal planes. Also find maximum shearing stress. (10)

OR

6. a. List theories of failure and explain their significance also explain the application of each theory of failure (8)

b. A blot is under an axial pull of 24 kN together with a transverse shear force of 5 kN. Calculate the diameter if bolt using (10)

(i) Maximum principle stress theory

(ii) Maximum shear stress theory

(iii) Strain energy theory

Take , elastic limit of bolt material as 250Mpa and μ= 0.3 Factor of safety is 2.5

SECTION – II

UNIT - IV

7.a. State the assumption in theory of simple bending and derive the flexure formula. (8)

b. A beam having a cross section in the from of channel (see figure 7b) is subjected to a bending moment acting about the axis . calculate the thinkness of the channel in order that the bending stresses at the top and bottom of the beam will be in the ratio 7:3, respectively. (8)

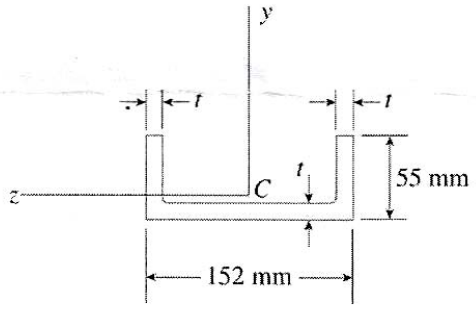


Figure 7b

OR

8. a. A Rectangular beam is simply supported at the end and carries a point load at the center . Establish the relation between maximum bending stress and maximum shear stress (8)

b. The T-beam shown in the figure 8b has cross- sectional dimentions : b= 220 mm, *l*= 15 mm, h = 300mm, and h_1 = 275mm. the beam is subjected to a shear force V = 60 kN. Determine the maximum shear stress in the web of the beam. (8)

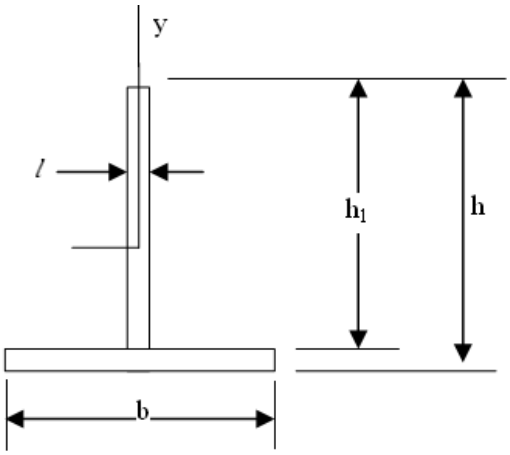


Figure 8b

UNIT – V

9. a. a composite shaft consist if copper rod of 20 mm diameter enclosed in a steel tube of 60 mm external diameter and 20 mm thick thee shaft is require to transmit to torque if 1200 N-m Determine the shear stresses developed in the copper and steel . if both the shaft have equal length and welded to a plate at each end so that their twists are equal take modulus of rigidity for steel as twice that of copper. (8)

b. A composite shaft made of 40 mm solid steel.The shaft is covered by tightly fitting alloy tube of 60 mm external diameter and 40 mm internal diameter. The shafts are tightened together so as to prevent any relative motion between two maximum permissible shear stress in steel and alloy are 60 and 38 MPa respectively find maximum power transmitted by composite shaft at 600 rpm Take G_{steel} = 80 GPa and G_{alloy} = 44 GPa (8)

OR

10. a . determine the crippling load for a T section of dimensions 10 cm X 10 cm X 2 as shown in figure 10 a and having length of 5 m. it's hinged at both ends.E = 200 GPa. (8)

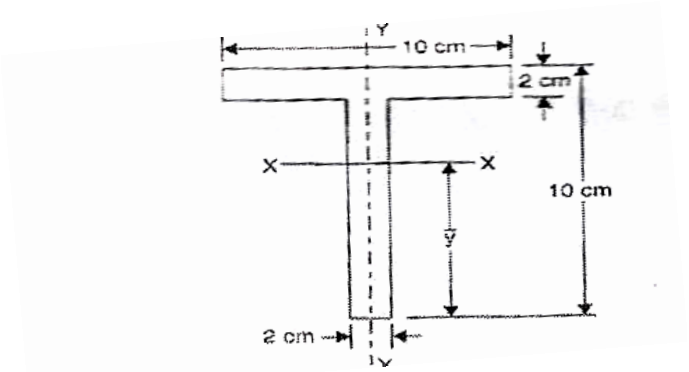
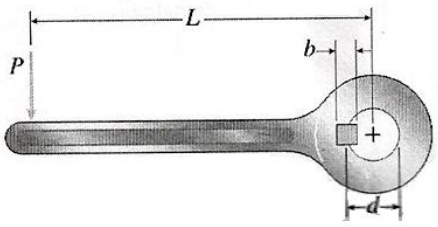


Figure 10a

b. Derive Euler's formula for buckling load for aluminium with hinged ends Also state the limitation if Euler's formula (8)

UNIT – VI

11. a. A specially designed wrench is used to twist a circular shaft by means of a square key that fits into slots (or Keyways) in the shaft and wrench as shown in the figure 11a. shaft has diameter d, the key has a square cross section of diameters b X b , and the length of the key is c the key fits half into the wrench and half into the shaft (i.e. the keyways have a depth equal to b/2). Derive a formula for the average shear stress in the key when a load p is applied at distance L from the center of shaft. Disregard the effects of friction, assume that the bearing pressure between the key and the wrench is uniformly distributed and draw free –body diagrams of the wench and key. (12)



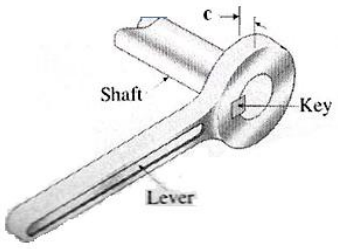


Figure 11a

b. Explain product life cycle (6)

OR

12. a Design a knuckle joint for a tie rod of circular section for a maximum pull of 15 kN . The yield strength of material is 315 N/$m\,m^2$ .Allowable stress in shear is 100N/mm^2 Permissible stresses are same in tension and compression . take factor of safety as 2.

(12)

b. Write a short note on design synthesis [6]

[Total No. of Questions:12] **[Total No. of Printed Pages: 4]**

UNIVERSITY OF PUNE

[4362]-121

S.E. (Mechanical Sandwich) Examination-2013

Thermal Engineering

(2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1. **Answer any 3 question from each Section.**
2. **Answers to the two sections should be written in separate answer-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

Q.1 a) What is a polytropic process? Derive an expression for the work done during a polytropic process by representing the process on P-V diagram. [4]

b) Give the statement of First Law of Thermodynamics for a cycle and for a closed system undergoing a process. What are limitations of First Law of Thermodynamics? [4]

c) Two heat pumps are connected in series between two heat reservoirs at 'T_1' and 'T_2'. Heat pump 'A' pumps heat from a reservoir at T_2 and rejects heat to a reservoir at 'T_1' while the heat pump 'B' pumps heat from reservoir at 'T' to a reservoir at 'T_1'. If $T_1 > T_2$, show that [8]

i) Intermediate temperature 'T' is the arithmetic mean of temperatures 'T_1' and 'T_2' if the work input to both pumps is equal

ii) The temperature is the geometric mean of temperature 'T_1' and 'T_2' if the heat pumps have equal COP.

OR

Q.2 a) State and prove Clausius Theorem of entropy. What is Clausius Inequality? [4]

b) Differentiate between $\int pdv\ work\ and - \int Vdp\ work$. [4]

c) 100kg of water at 100ºC is mixed with 50kg of water at 50ºC, while the surrounding temperature is 27ºC. Determine the decrease in availability due to mixing. [8]

Q.3 a) Write a short note on IBR, mentioning provisions in IBR. [4]

b) Explain construction and working of Benson boiler with a neat sketch. [4]

c) A boiler plant supplies 5400kg of steam/hr at 7.5 bar and 0.98dry from water at 41.5ºC, When using 670kg of coal/hr having calorific value of 31000KJ/kg. Determine: [8]

i) The efficiency of the boiler

ii) The equivalent evaporation from and at 100ºC.

OR

Q. 4 a) Write a short note on heat balance sheet for a boiler. [4]

b) Following readings were obtained during a trial on two boilers: [12]

Boiler	Pressure	Quality of steam	Evaporation rate	Feed water Temperature
I	10 bar	0.9 dry	8.5Kg/Kg of fuel	40ºC
II	15 bar	300ºC	8.0Kg/Kg of fuel	60ºC

Fuel used has a Calorific value of 3000KJ/Kg. Compare these boilers in respect of equivalent evaporation and thermal efficiency.

Q.5 a) Write a short note on Mollier diagram for steam. [4]

b) What is the effect of inlet pressure, exhaust pressure and superheat on Rankine cycle efficiency? [6]

(c) The following data were obtained with a separating and throttling calorimeter: pressure in the pipeline 1.5MPa, condition after throttling 0.1MPa and 110ºC, Moisture collected in separating calorimeter/5min 0.15 lit at 70ºC, steam condensed after throttling 3.24Kg. [8]
Find the quality of steam in the pipe.

OR

Q.6 a) Explain- combined separating and throttling Calorimeter and how does it overcome limitations of separating calorimeter and throttling calorimeter? [6]

b) Calculate the cycle efficiency and steam consumption in Kg/KWh for Carnot cycle and Rankine cycle using steam between two pressures of 20bar and 0.1bar. The steam is dry and saturated at 20 bar. [12]

SECTION II

Q.7 a) Explain: Alternative fuels for I.C. Engines. [5]

b) Explain: Flue gas analysis using Orsat apparatus. [5]

c) During bomb calorimeter test on diesel oil, following data were recorded: room temperature 25ºC, weight of crucible 8.116gm,weight of crucible and oil 8.702gm, weight of can and water 3.492kg, rise in temperature of can and water 2.305ºC, fuse correction for the heat supplied by the fuse to the bomb 0.12kJ. [6]

Find the higher calorific value of diesel oil.

OR

Q.8 a) Explain with neat sketch Boy's gas calorimeter. [5]

b) Explain: Conversion between gravimetric and volumetric analysis of fuels. [5]

c) Write the equations of combustion for [6]

i) C_6H_{14} Find the amount of oxygen required in terms of Kg/Kg of fuel for complete combustion in each case. Assume constant pressure. Find also air to fuel ratio in each case.

Q.9 a) Enlist the assumptions made for air standard cycles. [4]

b) An engine working on Otto cycle in which the salient points 1,2,3,4 has upper and lower temperature limits T_3 and T_1. If the maximum work per kg of air is to be done, then show that the intermediate temperature is given by $T_2=T_4=\sqrt{T_1 T_3}$. [6]

c) The parameters of the initial stage of 1kg of air in the cycle of an I.C. engine are 0.95 bar, 65ºC. The compression ratio is 11. Compare the values of ideal thermal efficiency for dual combustion cycle with equal heat supplied in constant pressure and constant volume heat supply process. Assume total heat supplied to be 800KJ. [6]

OR

Q.10 a) Derive the expression for mean effective pressure (MEP) of Diesel cycle. [6]

b) The following data refer to an oil engine operating on dual cycle. Compression ratio is 11.6, pressure and temperature at the beginning of compression 1 bar and 320K, percentage increase of pressure during constant volume burning is 53% and percentage volume increase during constant pressure is 38%. If $C_P=1.089$ and $C_V=0.795$ and that the compression and expansion are isentropic, find MEP of the cycle. [10]

Q.11 a) Discuss the effect of clearance on volumetric efficiency. [8]

b) A 2 stage single acting air compressor takes in air at 1 bar and 300K. Air is discharged at 10bar. The intermediate pressure is ideal and inter cooling is perfect. The law of compression is $PV^{1.3}=C$. The rate of discharge is 0.1kg/sec. [10]

Find

i) Power required to drive compressor
ii) Saving in work compared with single stage.
iii) Isothermal efficiency for multistage and single stage
iv) Heat rejected in intercooler.

Take R=0.287 and C_P=1KJ/Kg-K.

OR

Q.12 a) Prove that the heat rejected per stage per kg of air in a reciprocating air compressor with perfect inter cooling is given by $\left[C_p + C_v\left(\frac{r-n}{n-1}\right)\right](T_2\text{-}T_1)$ where $(T_2\text{-}T_1)$ is temperature rise during each stage. [8]

b) A single stage double acting compressor running at 120rpm and power input=75KW, piston speed=200m/min section pressure is 1bar and delivery pressure is 10bar, η_{vol}=85%. Assuming $PV^{1.25}$=C for expansion and compression find cylinder bore diameter and V_c as percent of V_s. [10]

[Total No. of Questions: 12] **[Total No. of Printed Pages: 5]**

UNIVERSITY OF PUNE
[4362]-122
S. E. (MECHANICAL S/W) Examination - 2013
TOM MD - I (2008 Course)

[Time: 4 Hours] **[Max. Marks: 100]**

Instruction:

1 *Answers to the two sections should be written in separate answer-books.*
2 *Neat diagrams must be drawn wherever necessary.*
3 *Black figures to the right indicate full marks.*
4 *Assume suitable data, if necessary.*

SECTION -I

Q.1 A Explain different types of constrained motions with suitable examples. 6

B Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of double Slider crank chain? Give their applications? 6

C Calculate the number of degree of freedom of the mechanism as shown in fig.01 6

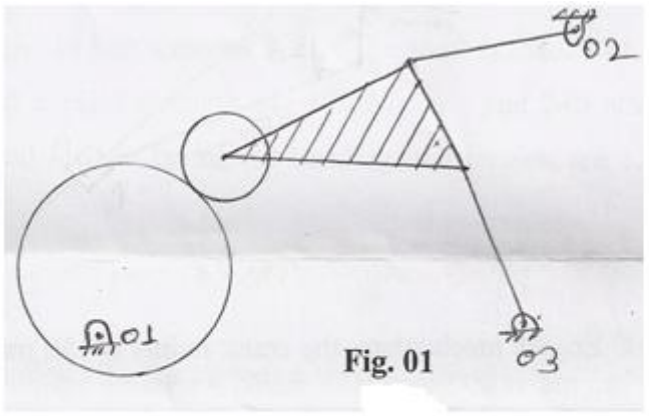


Fig. 01

OR

Q.2 A Derive the condition for exact steering and prove that it is satisfied in Davis steering gear. 8

B The driving shaft of Hooke's joints runs at a uniform speed of 240 rpm and the angle between the shafts is 20^0. The driven shaft with attached masses of 55 Kg at a radius of gyration of 150 mm, If a steady torque of 200 Nm resists rotation of the driven shaft, find the torque required at the driving shaft when angle turned through by the driving shaft is 45^0. At what angle between the shaft will the total fluctuation of speed of the driven shaft be limited to 24 rpm 10

Q. 3 A The kinematic diagram of one the cylinders of rotary engine is shown in fig.02. OA is the crank which is vertical and fixed & OA is 50 mm long. The length of connecting rod AB is 125 mm. The line of stroke OB is inclined at 50^o to vertical. The cylinder is rotating at a uniform speed of 300 mm, in a clockwise direction, about the fixed center O. Calculate, 18

i) acceleration of the piston inside the cylinder and
ii) Angular acceleration of connecting rod.

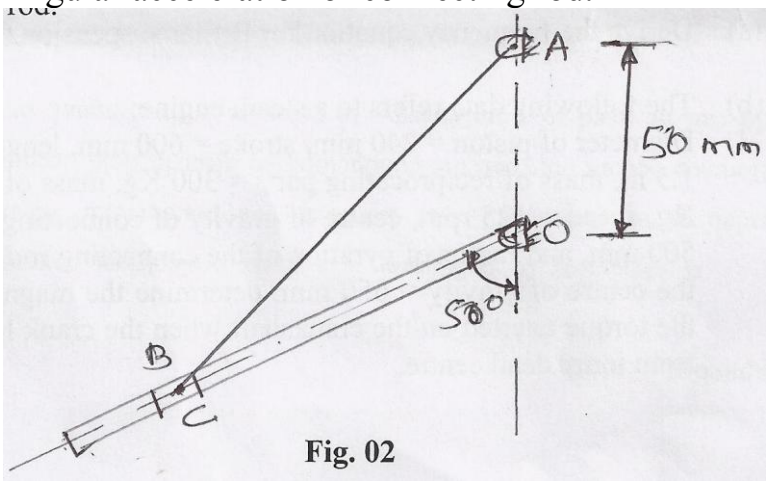


Fig. 02

OR

Q. 4 A Fig.03 show the configuration of a without quick return mechanism. The length of fixed link OA and the crank OP are 200 mm and 350 mm respectively. Other lengths are AR= 200 mm and RS = 400 mm. Find the velocity of the ram using the instantaneous method when the crank makes an angle of 120^o with the fixed link and rotates at 10 rad/s. 10

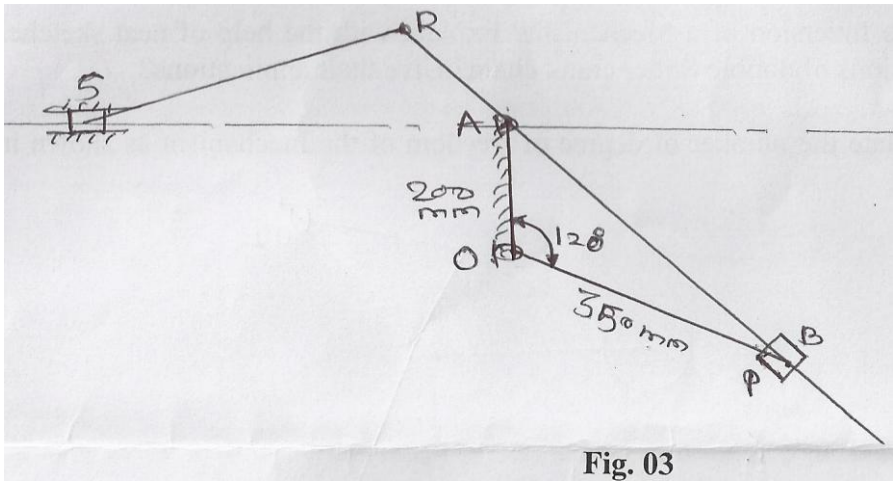


Fig. 03

B In an I C Engine mechanism, the crank radius is 150mm and the length of connecting rod is 600 mm. The crank is rotating anticlockwise direction at angular velocity of 47.12 rad/s. Using complex algebra method, determine the velocity of piston and angular velocity of the connecting rod when the crank is 60^{o} from the inner dead center. 8

Q. 5 A In a slider crank mechanism, the crank is 200 mm and the connecting rod length is 800 mm. Find analytically the velocity and acceleration of piston & angular velocity and angular acceleration of connecting rod when the crank is turned through 60^{o} from the inner dead center. The angular velocity of the crank is 20 rad/sec and is increasing at the rate of 10 rad/ sec^2 8

B In an IC engine mechanism, the crank radius is 400 mm and connecting rod is 950 mm long. The diameter of piston is 100 mm and net gas pressure acting on piston is 15 MPa. Find 8

i) Thrust in connecting rod,
ii) Piston side thrust
iii) Torque acting on crank shaft and
iv) Load on main bearing when crank had made 45 degree from TDC

OR

Q. 6 A Derive the frequency equation for Bifilar suspension. 8

B The following data refers to horizontal reciprocating engine: Mass of reciprocating parts = 100 Kg, Stroke Length = 200 mm, Speed of engine = 900 rpm clockwise, Connecting rod mass = 80 Kg. Length between centers = 400 mm, Distance of C.G. from end center = 160 mm, radius of gyration of 8

connecting rod about an axis through C.G = 120 mm. Determine analytically the inertia torque on crankshaft when the crank has turned 40^o from I.D.C.

SECTION II

Q. 7	A	Explain the stresses induced in single V butt weld.	6
	B	A belt pulley is keyed to the shaft midway between the supporting bearings kept at 1000 mm apart. The shaft transmit 20 kW power at 400 r.p.m. The pulley has 400 mm diameter. The angle of warp of belt on pulley is 180^o and the belt tension acts vertically downwards. The ratio of belt tensions is 2.5. The shaft is made of steel having an ultimate tensile strength of 400 N/mm^2 and 240N/mm^2 respectively. The combined shock and fatigue factor is bending and torsion are 1.5 and 1.25 respectively. Design the shaft.	10

OR

Q. 8	A	With neat diagram sketch, describe the various types of welded joints.	4
	B	" A square key is stronger against crushing than rectangular key" Justify the statement.	4
	C	Discuss design procedure for rigid flanged coupling along with relevant equation and necessary sketches	8
Q. 9	A	Write a note on „Differential and Compound screws'.	6
	B	Explain nipping of leaf spring	4
	C	Determine the required number of coils and the allowable deflection in a helical spring made of 1.6 mm diameter wire. Assume the spring index as 6 and permissible shear stress as 345 N/mm^2. The stiffness of the spring is to be 1.8 N/mm and modulus of rigidity of spring material is 80 GPa.	6

OR

Q. 10	A	Explain the construction of multileaf spring with sketch.	6
	B	A nut a screw-nut combination, having double start square threads of 25 mm nominal diameter and 5 mm pitch, is acted upon by an axial load of 10 kN, against the direction of its linear motion. The outer and inner diameter of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction are 0.2 and 0.15 respectively. The screw only rotates at 12 r.p.m. speed while the nut only translates. Assuming uniform wear condition at	10

collar determine

i) Power required to rotate the screw.
ii) Stresses in screw body

Q. 11 A Explain the turning moment diagram of four stroke internal combustion engine. 6

B A pulley of 1000 mm diameter is driven by an open type flat belt from 25 kW, 1440 r.p.m. electric motor. The pulley on the motor shaft is 250 mm in diameter and the center distance between the two shafts is 2 meters. The allowable tensile stress for the belt material in 2 N/ mm^2 the coefficient of friction between the belt and pulley is 0.28. The density of the belt material is 900 kg/m^3. If the belt material is 125 mm determine 12

i) The thickness of belt
ii) The length of belt and
iii) The initial tension required in the belt

OR

Q. 12 A Write short notes on the following . (any two) 10

i) Selection of flat belt from manufacture's catalogue
ii) Slip and creep belt.
iii) Stresses in flywheel rim.

B A twin cylinder engine, with crank at right angles, develops 75 kW power at a mean speed of 400 r.p.m The coefficient of fluctuation of speed is limited to 0.03. The mean diameter of the flywheel is 1.2 meter. The maximum variation of energy per cycle is found to be 20% of the energy per cycle. If the arms and hub contribute 5% of the flywheel effect, determine the necessary dimensions of a square rim section of cast iron which has density of $7000kg/m^3$ 8

UNIVERSITY OF PUNE

[4362]-123

S. E. (Mechanical SW)Examination – 2013

THERMAL ENGINEERING-II

[2008 COURSE]

[Time : 3 Hours] **[Max. Marks : 100]**

Total No. of Questions : 12 **[Total No. of Printed Pages :5]**

Instructions :

i) Answer **any three** questions from each section.

ii) Answers to the two sections should be written in separate books.
Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

iii) Neat diagrams must be drawn wherever necessary.

iv) Black figures to the right indicate full marks.

v) Your answers will be valued as a whole.

vi) Assume suitable data, if necessary.

SECTION I

UNIT NO:1

Q1 a) Explain ammonia absorption refrigeration cycle with a neat sketch 6

b) Write a short note on- Alternative refrigerants. 4

c) In air refrigeration system working on Bell-coleman cycle, the system draws cold air at 1bar, 13°c from the cold chamber at the rate of 5kg/sec. It is compressed isentropically in a compressor upto the temp. of 27°c and then it is expanded isentropically in the expander upto atmospheric pressure and discharged to the cold chamber. Compressor and expander, both runs at a speed of 300 rpm. Determine: 6

i) COP of the system

ii) Tons of refrigeration produced

iii) Stroke volume of compressor and expander assuming both are single acting type.

OR

Q2 a) 3000 kg of ice per day is produced from and at 0°c in an ammonia ice plant working on vapour compression cycle. The temp range of cycle is -15°c to

25°c. The vapour at the end of compression is dry-saturated. The relative COP of the system is 65%. Find the power required to drive the plant.
Properties of NH_3 refrigerant are as below:

Ts (°c)	P (bar)	v (m^3/kg)	h_f (kj/kg)	h_g (kj/kg)	S_f (kj/kg k)	S_g (kg/kg k)
-15	2.36	0.509	112.3	1426	0.457	5.549
25	10.01	0.128	298.9	1466	1.124	5.039

Latent heat of ice=335kj/kg 8

b) Compare vapour compression cycle and vapour absorption cycle 4

c) Explain reverse Carnot cycle 4

UNIT NO:2

Q3 a) Explain the following terms: 6

i) DBT
ii) WBT
iii) Dew point temp
iv) Specific humidity
v) Saturated air
vi) Dalton's law of Partial pressure

b) Differentiate between central and unitary systems 6

c) Discuss effective temp. 4

OR

Q4 a) Represent the following processes on psychrometric chart and explain 6

i) Cooling and dehumidification ii) Adiabatic evaporative cooling iii) Heating and humidification iv) Heating and dehumidification

b) Discuss the factors which affect human comfort 4

c) Explain the working of room air conditioner. 6

UNIT NO:3

Q5 a) Write a short note on: 8

i) Thermostatic expansion valve

ii) Automatic expansion valve

b) Explain types of evaporators used in air conditioning system. Explain anyone with a neat sketch. 5

c) Explain: Evaporative condenser 5

OR

Q6 a) Explain: Pressure losses in duct 4

b) Explain: Various methods used for duct sizing in air conditioning system 6

c) Comment on: Dynamic losses in duct 4

d) Explain common refrigeration control 4

SECTION-II

Q7 a) Classify I.C. engines 4

b) Explain: Splash lubrication system 4

c) Compare battery and magneto ignition system 4

d) Explain: Valve timing diagram for high speed engine 4

OR

Q8 a) Explain: Morse Test 4

b) In a test on single cylinder oil engine with 30cm bore and 45cm stroke and working on 4 stroke cycle following observations were made.

Duration of trial: 1hr

Total fuel consumption: 7.6 kg
C.V. of fuel: 45000 kj/kg
Total revolutions made: 12000
MEP: 6bar
Net brake load: 150 kg
Brake drum dia: 180cm
Rope dia: 3cm
Mass of jacket cooling water: 550kg
Inlet temp. of jacket cooling water: 15°c
Exit temp. of jacket cooling water: 60°c
Temp. of exhaust gases= 300°c
Total air consumption: 365 kg
Sp.heat of exhaust gases: 1kj/kg k
Calculate:
i) IP
ii) BP
iii) Mechanical efficiency
iv) Indicated thermal efficiency
Draw up heat balance sheet on minute basis 12

UNIT NO:5

Q9 a) Explain: Types of combustion chambers in SI engines 8

b) Explain stages of combustion in CI engine 8

OR

Q10 a) Explain: 8
i) Ignition Delay
ii) Cetane number
iii) Diesel knock
iv) Rating of CI engine fuels
b) What do you understand by pre-ignition? How it leads to detonation? 4

c) Explain: 4
i) Run on
ii) Run away
iii) Wild ping

iv) octane number

UNIT NO: 6

Q11 a) Explain the limitations of supercharging in SI and CI engines 6

b) Write a short note on: catalytic converter 6

c) Explain: Latest proposed emission norms 6

OR

Q12 a) Explain with neat sketch pulse type supercharging with its advantages 6

b) Discuss various methods of control for exhaust emission from petrol engines 6

c) Explain EGR system 6

UNIVERSITY OF PUNE

[4362]-124

S. E. (MECH S/W) Examination - 2013

MANUFACTURING ENGG

(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed pages :4]**

[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 answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(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

Que 1 a] What do you understand by the Term gating system ? Draw neat sketches of different gates in castings [6]

b] Explain the different types of casting defects with reference to causes & remedies [8]

c] Describe with neat sketch of roll forging [4]

OR

Que 2 a] Define extrusion process ? compare direct extrusion & indirect extrusion [8]

b] Differentiate between hot working & cold working of metal with advantages & disadvantages. [6]

c] Define pattern ? list the various allowances on pattern [4]

Q 3 a] Describe shielded metal arc welding [SMAW] with respect to principle [8]

process, advantages , limitations & application

b] Write short note on- [8]

i] Flames used for gas welding process

ii] Comparision between Soldering & Brazing

OR

Q 4 a] Describe with the help of suitable [8]

working setup the principle & operation of Gas Tungsten arc welding [GTAW]

b] Write short notes on [8]

i] Seam Welding process

ii] Adhesive bonding process

Q 5 a] Define taper? Describe different [8]

methods of taper Turning on centre lathe

with simple sketches.

b] Draw a sketch of single point cutting [8]

Tool & Describe all angles.

OR

Q 6 a] Draw a neat sketch of [8]

universal milling machine & label different

parts and state the function of each part,

b] Write short notes on [8]

i] Radial drilling machine

ii] Universal Dividing head

Section II

Q 7 a] Write the Functions of cutting fluid & various types cutting fluid used in metal cutting process [6]

b] Differentiate between Gear hobbing & Gear shaping process. [6]

c] During an orthogonal machining operation of C-60 steel The following data were recorded.- [6]

i] Chip thickness = 0.45mm

ii] Width of cut = 2.5 mm

iii] feed =0.25mm/rev.

iv] Tangentialcut force = 1130N

v] Feed Thrust force = 295N

vi] Rake angle $=10^0$

vii] Uncut chip thickness = 0.25mm

viii] Cutting speed = 2.5m/s

calculate

a] Shear angle [ϕ].

b] Shear farce [fs].

c] coefficient of friction [μ]

OR

Que 8 a] Explain various Gear finishing method [6]

b] Explain merchant's force circle diagram [6]

c] The useful Toollife of a HSS Tool machining mild steel at 28 m/min is 3 hrs. Calculate The tool life , when The tool operates at 40 m/min [6]

[Assume n= 0.125]

Que 9 a] Explain the working Principle of ultrasonic machining process [8]
[USM] & Discuss various parameters affecting the process.

b] Write short notes on [8]

i] machining centre

ii] FMS

OR

Que 10 a] Explain the classification of NC System according to tool [8]
positioning with suitable example.

b] Write short notes on [8]

i] ECM.

II] PAM.

Que 11 a] Explain working principle of Shearing & blanking operations [6]
with neat sketches.

b] What is indexing in fixture? How they are classified. [6]

c] Differentiate between Progressive Die & compound die. [4]

OR

Que 12 a] What is centre of Pressure? Explain methods of calculating centre [6]
of pressure with the help of suitable example

b] What do you know about 3-2-1 Principle Explain with figure [6]

c] Differentiate between jig & fixture [4]

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S. E. (Mechanical S/W)

(Semester - II) Examination - 2013

COMPUTER APPLICATION

(2008 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :5]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1)Answers to the **two sections** should be written in **separate answer-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

Q1 . a)The vander waal's equation for real gases is given by $(p+\frac{a}{v^2})(v-b) = RT$

Where p = pressure = 1 kN/m^2

R = Gas constant = 0. 82 kJ/$kg^0\ k$

a = constant = 3.82

b=constant=0.06

v= volume

T = temperature

Using Newton-Raphans method. Find the volume at 300^0 k do 2 iteration Assume initial volume = 20 m^3 /Kg [8]

b) Draw the flow chart for regular – falsi method [4]

c) Compute the integral I = $\int_1^2 xe^x\ .dx$ using gauss – two point formula [4]

OR

Q2 a) The velocity of car (running on straight road) at intervals of 2 minutes are given below.

Timer(min)	0	2	4	6	8	10	12
Velocity (km/hr)	0	22	30	27	18	7	0

Find the distance covered by car using Simpson's 1/3 rule.

b) Draw the flow chart for gauss-three point method. [4]

c) Draw the graphical representation for successive approximately method [4]

Q3 a) The temperature viscosity relationship is given for hydrodynamic bearing is as follows,

t^oC	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 suitable method. [8]

b) Find $\frac{dy}{dx}$ & $\frac{d^2y}{dx^2}$ at x = 0.6 the given values of x & y are,

X	0	1	2	3	4
Y	1	1.8	13	28	39

OR

Q4 a)Frame the given table, estimate the number of student who obtained marks between 40 & 45. [8]

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

b) Find $\frac{dy}{dx}$ & $\frac{d^2y}{dx^2}$ at x = 0.4

from for following given value of x & y. [8]

X	0.1	0.2	0.3	0.4	0.5
Y	-2.3	-1.6	-1.2	-0.91	-0.69

Q 5 a) Solve the equations [10]

$10\,x_1 - 2\,x_2 - x_3 - x_4 = 3$

$-2x_1 + 10\,x_2 - x_3 - x_4 = 15$

$-x_1 - x_2 + 10x_3 - 2\,x_4 = 27$

$-x_1 - x_2 - 2x_3 + 10\,x_4 = -9$

By gauss –Seidal interaction method.

b) Explain LU decomposition method [8]

OR

Q6 a) Apply gauss – Jordan method to solve the equations. [10]

x + y + z =9

2x – 3y + 4z=13

3x + 4y + 5z = 40

b) Explain [8]

(i) partial pivoting

(ii) complete pivoting

iii) Limitation of Elimination method

(iv) IU (condition) solution

SECTION II

Q7 a) The following data fit the curve of the type $y = ax^b$ [8]

X	10	20	30	40	50	60	70	80
Y	1.06	1.33	1.52	1.68	1.81	1.91	2.01	2.11

b) Explain the following types of errors with example [8]

(i) Absolute Error

(ii) Relative Error

(iii) percentile Error

(iv) Truncation Error

OR

Q8 a) Fit the second degree equation [10]

$y = ax^2 + bx + C$ to the following data points.

X	0	2	4	7	8
Y	1	17	57	162	209

Solve the simultaneous equation by using grass Jordan method

b) Draw the flowchart for fitting straight line. [4]

c) Explain Error propagation [4]

UNIT –V

Q9 a) Using Runge kutta method for fourth order find y(0.1), y(0.2) , & y(0.3)

Given by $\frac{dy}{dx}$ =1 + xy y(0)=2 [10]

b) Draw a flowchart for modified Euler method [6]

OR

Q10 a) Given by $\frac{dy}{dx}$ = y . sin (x) [6]

y(0)=1

Evaluate y(2) by Euler method Take h =0.5

b) Given $\frac{dy}{dx} = \frac{1}{2}(1 + x^2)\ y^2$ [6]

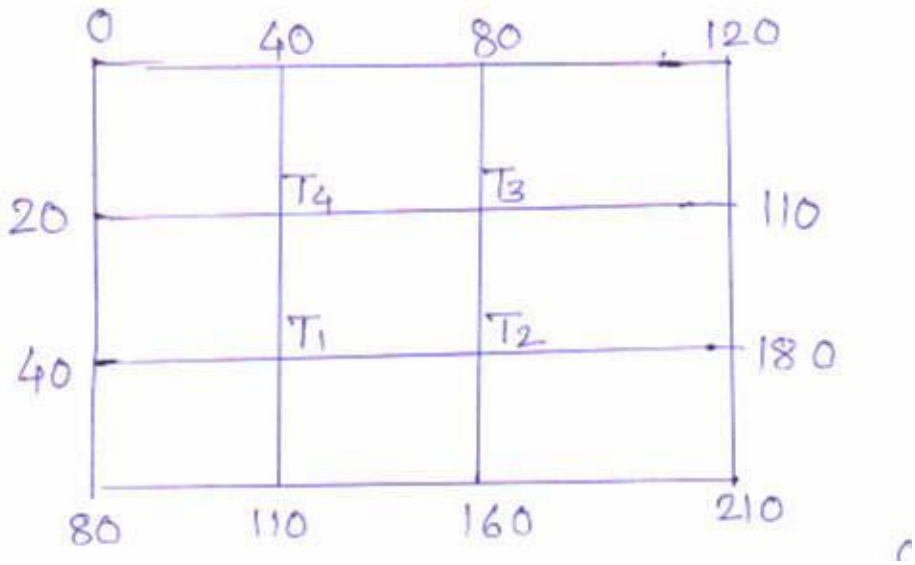
y(0) =1, y(0.1) = 1.06, y(0.2), = 1.12, y = (0.3)=1.21

evaluate y (0.4) by Milne's predictor method

c) Draw a flowchart for Taylor series [4]

Q11 a) A insulate metallic bar in using held in air [12]

Solve Laplace equation (2D head flow) with respect to the grid as shown in fig . compute T_1 , T_2, T_3 & T_4



b) Explain finite approximation method [6]

OR

Q12 a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition [12]

Using shmidt method at x= 0 & x = 0.5

u=1 for all the values of t at 0 u=1 for t = 0.5

u = 2x +1 for 0<x<0.5 take increment in x as 0.1 & increment in t as 0.01

Find the value of u for t= 0 to t= 0.03

b)Draw a flowchart for Poisson's equation [6]