



[3817] – 703

T.Y. B.Sc. (Semester – III) Examination, 2010
MATHEMATICS (Paper – III) (Old Course)
MT-333 : Problem Course (Based on MT-331 and MT-332)
(2004 – Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Answers to the two Sections should be written in separate answerbooks.*

SECTION – I
(Metric Spaces)

1. Attempt **each** of the following : **5**

- i) Let $A = \{ 1, 2, 3, \dots, n \}$ and let $B = \{ 0, 1 \}$. How many functions are there from A to B ?
- ii) True or false : If ρ is a metric for a set M, then so is $-\rho$. Justify.
- iii) Show that $\left\{ \frac{1}{n} \right\}_{n=1}^{\infty}$ is not a Cauchy sequence in R_d .
- iv) Let $[0, 1]$ be a metric space with the metric $\rho(x, y) = |x - y|$. Give an example of a countable dense subset of $[0, 1]$.
- v) Let $f : [0, 1] \rightarrow [0, 1]$ be a function defined as $f(x) = x$, show that f is uniformly continuous.

2. Attempt **any two** of the following : **10**

- i) Show that $N \times N$ is a countable set.
- ii) Prove that $(0, \infty)$ and $(0, 1)$ are homeomorphic metric spaces with respect to the absolute value metric.
- iii) If $T(x) = x^2 \left(0 \leq x \leq \frac{1}{3} \right)$, prove that T is a contraction on the absolute value metric space $\left[0, \frac{1}{3} \right]$.

P.T.O.



3. Attempt **any one** of the following :

5

i) Prove that a connected subset of \mathbb{R}_d is compact.

ii) Let $f(x) = \cos x$, $x \in \mathbb{R}'$. Show that, f is uniformly continuous function on \mathbb{R}' .

SECTION – II
(Real Analysis – I)

1. Attempt **each** of the following :

5

i) Give an example of a sequence $\{S_n\}_{n=1}^{\infty}$ of real numbers for which $\{|S_n|\}_{n=1}^{\infty}$ converges but $\{S_n\}_{n=1}^{\infty}$ does not.

ii) Discuss the convergence of series $\sum_{n=1}^{\infty} \frac{1}{10^{10}} \frac{n+1}{n+2}$.

iii) Find the sum of convergent series $\sum_{n=1}^{\infty} \frac{1}{2n(n+1)}$.

iv) Evaluate $\lim_{n \rightarrow \infty} \frac{1}{n} \left[\left(\frac{1}{n}\right)^2 + \left(\frac{2}{n}\right)^2 + \dots + \left(\frac{n}{n}\right)^2 \right]$.

v) If $F(x) = \int_0^x \sqrt{t+t^3} dt$ then find $F'(3)$.

2. Attempt **any two** of the following :

10

i) For $\varepsilon > 0$, find $N \in \mathbb{I}$ such that $\left| \frac{3n}{n+5\sqrt{n}} - 3 \right| < \varepsilon$ for all $n \geq N$.

ii) Show that if $|x| < 1$ then series $\sum_{n=1}^{\infty} n^{50} x^n$ converges absolutely.

iii) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n}{(n+1)(n+2)} x^n$ ($x > 0$).



3. Attempt **any one** of the following :

5

i) If $f(x) = x^2$ and for each $n \in \mathbf{I}$, $\sigma_n = \left\{0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n}{n}\right\}$ is a partition of $[0, 1]$,

then compute $\int_0^1 f$.

ii) If f' and g' are continuous on $[a, b]$ then prove the integration by Parts

$$\text{formula } \int_a^b f(x) g'(x) dx = f(b) g(b) - f(a) g(a) - \int_a^b f'(x) g(x) dx.$$



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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – III) (Old) (2004 Pattern)
PH – 333 : Classical Mechanics

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of logtables and calculators is allowed.*

1. Attempt **all** of the following (1 mark each) : **10**
- a) Define the term ‘centre of mass’.
 - b) Give the principle of rocket motion.
 - c) What is central force ? Give one example.
 - d) State Kepler’s third law of planetary motion.
 - e) Define the term ‘impact parameter’.
 - f) Give the difference between elastic and inelastic scattering.
 - g) What are cyclic co-ordinates ?
 - h) Give the advantage of Lagrangian formulation over Newtonian formulation.
 - i) How many co-ordinates are required to specify the rigid body with one point fixed ?
 - j) Estimate the total force acting on a body of mass 30 Kg relative to a frame moving downwards on earth with an acceleration of 3 m/s^2 .
2. Attempt **any two** of the following :
- a) Draw a graph of effective potential energy against position vector and explain different shapes of orbit. **5**
 - b) What are generalised co-ordinates ? Write the transformation equations for Cartesian to generalised co-ordinates. **5**
 - c) Obtain the relation between scattering angles θ and θ' in LAB and CM systems respectively. **5**

P.T.O.



3. Solve **any two** of the following :

- a) Earth rotates with the angular velocity of $7.27 \times 10^{-5} \text{ sec}^{-1}$. Calculate the centripetal acceleration at the equator of the earth. (Radius of earth = $6.46 \times 10^6 \text{ m}$). **5**
- b) Find the degrees of freedom for the following systems :
i) System of N particles
ii) Simple pendulum
iii) Rigid body. **5**
- c) Calculate the acceleration of the rocket if it ejects $\frac{1}{100}$ th of its mass with a velocity of $2 \times 10^5 \text{ m/s}$ ($g = 9.8 \text{ m/s}^2$). **5**

4. A) Attempt **any one** of the following :

- a) What do you mean by a projectile motion ? Obtain an equation of motion for the path of projectile in resistive medium. **8**
- b) Explain the term 'differential cross section'. Obtain the relation between differential cross section in LAB and CM system with reference to neutron-proton scattering. **8**

B) Attempt **any one** of the following :

- a) The particle is subjected to circular motion in x-y plane and linear motion along z-axis. Draw the trajectory described by the particle. **2**
- b) Show that the central force cannot exert a torque. **2**



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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – IV) (Old) (2004 Pattern)
PH 334 : Atomic and Molecular Physics

Time : 2 Hours

Max. Marks : 40

- N.B.:* i) *All questions are compulsory.*
ii) *Figures to right indicate full marks.*
iii) *Draw neat diagram wherever necessary.*

1. Attempt **all** of the following (**1 mark each**) : **10**

- a) What is zero point energy ?
- b) State Pauli's exclusion principle.
- c) State Lande's interval rule.
- d) What is Larmour precession ?
- e) State Duane and Hunt law.
- f) Find L and S values for 3D_2 state.
- g) What is spin orbit interaction ?
- h) What is multiplicity of state ?
- i) Define magnetic moment associated with orbital motion of electron.
- j) State Moseley's law for X-ray.

2. Attempt **any two** of the following :

- a) Define quantum state of an electron. Explain four quantum no. necessary for representing a quantum state. **5**
- b) Determine ground state of cadmium ($Z = 48$). Represent it using spectral notation. **5**
- c) In normal Zeeman effect, obtain an expression $\nu = \nu_0 + \Delta m_l \frac{eH}{4\pi m}$ where symbols have their usual meanings. **5**

P.T.O.



3. Attempt **any two** of the following :

- a) Explain Raman effect on basis of quantum theory. **5**
- b) Explain P and R branches in rotational – vibrational spectra. State selection rules. **5**
- c) Calculate linear velocity of an electron in third Bohr orbit using $h = 6.64 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/s, $e = 1.6 \times 10^{-19}$ c. **5**

4. A) Attempt **any one** of the following :

- i) Determine singlet-triplet terms for p-d electronic configuration using L-S coupling. **8**
- ii) Show that energy of rigid diatomic molecule is given by an expression

$$E_J = \frac{h^2 J(J+1)}{8\pi^2 I} \text{ where symbols have their usual meanings.} \quad \mathbf{8}$$

B) Attempt **any one** of the following :

- i) Give two difference between optical and X-ray spectra. **2**
- ii) Draw labelled diagram of experimental set-up for observing Zeeman effect. **2**



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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (A)) (Old) (2004 Pattern)
PH-336 (A) : Astronomy and Astrophysics – I

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following (**1 mark each**) : **10**
- a) State Bode's law.
 - b) What are extra-solar planets ?
 - c) What is meant by absolute luminosity of a star ?
 - d) State Kepler's laws of planetary motion.
 - e) What is meant by Neutrino problem in Astronomy ?
 - f) Explain the term 'Chandrashekar limit'.
 - g) How will you calculate I.S.T. from U.T. ?
 - h) What are Quasars ?
 - i) On what principle does the CCD camera works ?
 - j) State Hubble's law.
2. Attempt **any two** :
- a) Give comparison between reflecting and refracting telescope. **5**
 - b) Explain the 'Butterfly diagram'. **5**
 - c) Write a short note on 'Radio telescope'. **5**

P.T.O.



3. Attempt **any two** :

- a) Explain photospheric phenomenon on the sun. 5
- b) Write a short note on 'variable stars'. 5
- c) Write a short note on 'HST'. 5

4. A) Attempt **any one** :

- 1) Explain the various cosmologies with evidences. 8
- 2) Write a short note on 'Non-Optical Astronomy'. 8

B) Attempt **any one** :

- 1) Which optical filters are used in photometry ? 2
 - 2) Find the surface temperature of star if the λ_{\max} of a star is 6400 \AA . 2
-



T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (B)) (Old) (2004 Pattern)
PH-336 : Biophysics – I

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (**each** of mark **1**) : **10**
- a) State Nernst equation.
 - b) What is a cell ?
 - c) What is mitochondria ?
 - d) What is cytoplasm ?
 - e) What is transcription ?
 - f) Define action potential.
 - g) Mention different chemical component of DNA.
 - h) Define strain gauge.
 - i) Mention the full form of EGC and EOG.
 - j) State different types of electrodes.
2. Attempt **any two** :
- a) What is DNA ? Explain primary structure of DNA. **5**
 - b) Write a short note on genetic code. **5**
 - c) Distinguish between prokaryotic and eukaryotic cell. **5**



3. Attempt **any two** :

- a) Explain the role of water in cell. 5
- b) Discuss the structure and function of neuron. 5
- c) Write a short note on biopotential amplifier. 5

4. A) Attempt **any one** :

- a) Explain construction and working of Linear Variable Differential Transformer (LVDT). 8
- b) Draw frequency characteristics of biopotential amplifier. Explain the temperature stability of amplifier. 8

B) Attempt **any one** :

- a) Write the features of RNA. 2
 - b) What is plasma membrane ? 2
-



T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (C)) (Old) (2004 Pattern)
PH-336 : Communication Electronics – I (Ele. – I) (Gr. – A)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of electronic calculator or log table is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What is frequency modulation ?
 - b) What is PCM ?
 - c) What do you mean by half wave dipole ?
 - d) What is the need of wave shaping ?
 - e) State advantages of digital modulation.
 - f) State an advantage of PWM.
 - g) Define signal to noise ratio.
 - h) State an application of sky waves.
 - i) The wavelength of a radio station is 3 meters, what must be the frequency of its broadcast ?
 - j) State different types of filters.
2. Attempt **any two** of the following :
- a) Explain PAM. **5**
 - b) Write a short note on Yagi antenna. **5**
 - c) Explain varactor diode method to produce FM. **5**



3. Attempt **any two** of the following :

- a) Draw different layers of atmosphere. Explain their effect on signal transmission. 5
- b) Explain how a simple R-C circuit can be used as a high pass filter. 5
- c) In an AM wave, calculate the power saving when the carrier and one side band are suppressed corresponding to i) $m = 1$ and ii) $m = 0.5$. 5

4. A) Attempt **any one** of the following :

- a) Describe with neat diagram of different types of signal waveforms. Explain the concept of duty cycle in detail. 8
- b) What is the use of antenna in communication ? Explain parabolic reflector antenna in detail. 8

B) Attempt **any one** of the following :

- a) Draw block diagram of communication system. 2
 - b) Explain in short modulation index. 2
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T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (D))
PH-336 (D) : Electro-Acoustics and Entertainment Electronics – I
(Gr. – A) (Ele. – I) (Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculators is allowed.*

1. Attempt **all (one mark each)** : **10**
- a) Define reverberation.
 - b) Define directivity factor.
 - c) Define characteristic impedance.
 - d) State Eyring's formula in MKS system.
 - e) What is muffler ?
 - f) Give any two acoustical requirements of T. V. studio.
 - g) What do you mean by noise ?
 - h) Define porosity.
 - i) Define coefficient of transmission.
 - j) State Sabine's formula.
2. Attempt **any two** :
- a) Derive the equation of coefficient of transmission. **5**
 - b) Write a short note on acoustic filters. **5**
 - c) Discuss analogy between acoustical and mechanical systems. **5**

3. Attempt **any two** :

- a) Explain in brief general theory of side branch. 5
- b) Explain growth and decay of sound in dead room. 5
- c) Derive Sabines formula. What is its importance ? 5

4. A) Attempt **any one** :

- a) Describe the method for measurement of power levels and directional pattern of noise source. 8
- b) i) If velocity of sound at 0°C is 332 m/s, calculate velocity at 20°C and wavelength of sound of 400 Hz frequency at 0°C and 20°C.
- ii) In a certain measurement of pressure and intensity level of sound of autoriksha are 20×10^{-3} pa and 60 dB respectively, calculate pressure of sound for threshold of hearing and pressure of sound for normal conversation level (74 dB). 8

B) Attempt **any one** :

- a) What is room acoustics ? 2
 - b) Give noise control measures. 2
-



T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (E)) (Old) (2004 Pattern)
PH-336 : Medical Instrumentation – I (Ele. – I) (Gr. – A)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figure to the right indicates full marks.*
3) *Draw neat diagram wherever necessary.*

1. Attempt **all** of the following : **10**
- a) What is resting potential ?
 - b) What do you mean by impedance ?
 - c) What is transducer ?
 - d) Define low pass filter.
 - e) What is electrophoresis ?
 - f) State the normal B.P. values of male and female.
 - g) What is hematology ?
 - h) What is polarization ?
 - i) Draw the circuit diagram of op-amp as differentiator.
 - j) Draw the bridge circuit for measurement of resistance.
2. Attempt **any two** of the following :
- a) Explain blood gas and acid base measurement. **5**
 - b) Explain importance of metal electrodes for ECG recording. **5**
 - c) Write short note on piezoelectric transducer. **5**



3. Attempt **any two** of the following :

- a) Discuss macro and micro shock hazards. 5
- b) Explain the basic requirements of bio-potential amplifiers. 5
- c) Draw the circuit diagram of low pass and high pass active filters and explain it in detail. 5

4. A) Attempt **any one** of the following :

- a) What are biopotential electrodes ? Describe polarizable and non polarizable electrodes. 8
- b) What is spectrophotometry ? Give block diagram of spectrophotometer and explain principle, construction and working. 8

B) Attempt **any one** :

- a) Name any two radiation sources. 2
 - b) Explain the basic principle of thermocouple. 2
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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (F)) (Old) (2004 Pattern)
PH-336 : Motion Picture Physics – I

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Define zoom lens.
 - b) State factors affecting the speed of film.
 - c) State the full form of S.L.R.
 - d) State types of filters used in B/W photography.
 - e) State the types of films.
 - f) What is the use of range finder in camera ?
 - g) What are the types of light sources ?
 - h) State the defects of lens.
 - i) What is the composition of B/W negative film ?
 - j) What is the use of condenser lens in printing ?
2. Attempt **any two** of the following :
- a) Why filters are used in B/W photography ? **5**
 - b) Explain in short light meter and exposure meter. **5**
 - c) Explain in short contact printing and projection printing. **5**



3. Attempt **any two** of the following :

- a) Explain indoor lighting setup in brief. 5
- b) Classify films and printing papers used in B/W photography. 5
- c) Explain factors affecting the developing process in brief. 5

4. A) Attempt **any one** of the following :

- a) Explain stages involved in processing of B/W negative film. 8
- b) Give the general background of black and white photography. 8

B) Attempt **any one** of the following :

- a) Define focal length of lens. What is the unit of power of lens ? 2
- b) What are the remedies over defects of lens ? 2



T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (G)) (Old)
PH-336 : Renewable Energy Sources – I
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:*
- i) All questions are compulsory.*
 - ii) Figures to the right indicate full marks.*
 - iii) Draw diagrams wherever necessary.*
 - iv) Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Define solar constant.
 - b) What are advantage of selective coatings ?
 - c) What do you mean by global radiation ?
 - d) Define longitude and lattitude.
 - e) Which substances are used in sensible heat storage system ?
 - f) Write the energy balance equation of flat plate collector.
 - g) What are advantages of wind energy ?
 - h) What do you mean by Zenith angle ?
 - i) State the principle used in central storage system.
 - j) State the substances used in latent heat storage system.
2. Attempt **any two** of the following :
- a) What do you mean by environmental pollution ? How environment is polluted by conventional energy sources ? Explain. **5**
 - b) Explain solar dryer with neat diagram. **5**
 - c) What are the methods of storing thermal energy ? Explain the sensible heat storage system. **5**



3. Attempt **any two** of the following :

- a) Draw and explain the spectral distributive curve of solar radiations at the earth's surface. **5**
- b) Write a note on Tidal energy. **5**
- c) Explain the working of box type solar cooker with the help of neat diagram. **5**

4. A) Attempt **any one** of the following :

- i) What do you mean by basic earth solar angles and derived solar angles ?
Explain how average daily global radiation is estimated at specific location. **8**
- ii) Explain the effect of selective coating on liquid flat plate collector. **8**

B) Attempt **any one** of the following :

- i) Calculate efficiency of flat plate collector from following data :
 $Q_u = 400 \text{ Kcal/hr}$; $A_c = 2\text{m}^2$
 $I = 500 \text{ Kcal/hr m}^2$. **2**
- ii) What are different types of solar water heater ? **2**
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T.Y. B.Sc. (Sem. – III) Examination, 2010
PHYSICS (Paper – VI (H)) (Old) (2004 Pattern)
PH-336 : Basic Microprocessor and Programming – I
(Ele. – I) (Gr. – A)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What do you mean by Bus ?
 - b) Define demultiplexer.
 - c) Define resolution of D/A converters.
 - d) Convert $(10111011)_2$ to HEX.
 - e) Add $C5E2_{16}$ and $ABCD_{16}$.
 - f) What is SIPO and PISO ?
 - g) What is tristate switch ?
 - h) Add BCD 7 and BCD 5.
 - i) Describe the function of the READY in up 8085.
 - j) What do you mean by ASCII code ?
2. Attempt **any two** :
- a) Write and explain different types of semiconductor memories. **5**
 - b) Explain with the help of circuit diagram a mod-10 counter. **5**
 - c) Draw and explain 1 to 4 line demultiplexer. **5**

3. Attempt **any two** :

- a) Explain seven segment display. Draw the circuit diagram of common cathode seven segment display. **5**
- b) What is Bus ? Explain different types of Buses used in up 8085. **5**
- c) Explain the operation of 4 bit SISO shift register. Draw the timing diagram. **5**

4. A) Attempt **any one** :

- a) Draw the functional block diagram of up 8085. **8**
- b) Explain the working of 4 bit binary weighted resistor type DAC. Why this type of DAC are not popular ? Define accuracy and resolution. **8**

B) Attempt **any one** :

- a) Convert 0.794_{10} to binary number. **2**
- b) Convert $(227)_{10}$ to Hex number. **2**
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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (I)) (Old) (2004 Pattern)
PH-336 : Auxiliary Electronics

Time : 2 Hours

Max. Marks : 40

- N.B.:* i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Use of log table and calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What are the applications of transformer ?
 - b) State the types of capacitor.
 - c) What is the function of trigger in C.R.O. ?
 - d) What is the use of fuse in electrical circuit ?
 - e) Write the full form of LVDT.
 - f) State two type of relays.
 - g) List various types of microphones.
 - h) State different types of losses in transformer.
 - i) State full form of PCB.
 - j) State the relation between gauge factor (K) and Poisson's ratio (μ).
2. Attempt **any two** of the following :
- a) Describe the construction of IFT. State its use in electronic circuit. **5**
 - b) What is NTC and PTC in thermistors ? State the use of thermistor. **5**
 - c) Explain the construction of LVDT transducer. **5**



3. Attempt **any two** of the following :

- a) With block diagram, explain the working of Simpson 260 analog multimeter. **5**
- b) Explain the working of electromagnetic relay. State its functions. **5**
- c) Draw the block diagram of signal generator. Explain its working and applications. **5**

4. A) Attempt **any one** of the following :

- a) Describe the complete process of making printed circuit board. **8**
- b) Explain principle, working and typical applications of the strain gauge transducer. **8**

B) Attempt **any one** of the following :

- a) State the use of transducer. **2**
 - b) Find the turn ratio for transformer with $V_{in} = 230$ Volt and $V_{out} = 15$ Volt. **2**
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T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (J)) (Old) (2004 Pattern)
PH-336 : Elements of Material Science

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of calculators and log table is allowed.*

1. Attempt **all** of the following (1 mark each) : **10**
- a) State electrical properties of material.
 - b) What are thermosetting plastics ?
 - c) Define dielectric strength.
 - d) State characteristics of polymers.
 - e) What are objectives of phase diagram ?
 - f) Define stiffness of materials.
 - g) State any two properties of ceramic materials.
 - h) What is difference between elastic and plastic deformation ?
 - i) What is Schottky imperfection ?
 - j) What do you mean by solid solutions ?
2. Attempt **any two** of the following :
- a) Distinguish between addition polymerization and condensation polymerization. **5**
 - b) Compare between recovery and recrystallization. **5**
 - c) What do you mean by cold working ? Discuss the effect of cold working on metals. **5**



3. Attempt **any two** of the following :

a) Explain thermal properties of material. **5**

b) Calculate the density of FeO which has NaCl type structure. (Assume equal numbers of Fe and O ions) **5**

Given : For CN = 6, $r_{Fe^{2+}} = 0.074$ nm

$R_{O_2} = 0.140$ nm, At mass of Fe = 55.8 amu

At. mass of O = 16.0 amu.

c) Explain elastic deformation in detail. **5**

4. A) Attempt **any one** of the following :

a) Define CRSS. Derive an expression for CRSS. What tensile stress must be applied along the [100] of the crystal to initiate plastic deformation ? **8**

b) Discuss the phase diagram for two metals completely soluble in liquid state and completely insoluble in solid state. **8**

B) Attempt **any one** of the following :

a) Explain molecular length of polymer. **2**

b) Write short note on Frankel imperfection. **2**



T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (K)) (Old) (2004 Pattern)
PH-336 : Vacuum Technology

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log table and calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What is gas diffusion ?
 - b) Define mean free path.
 - c) Explain thermal conductivity of gas.
 - d) State the unit of vacuum.
 - e) Define the term pumping speed.
 - f) State any two applications of vacuum.
 - g) Explain the term out gassing.
 - h) State the ranges of vacuum.
 - i) State the working range of oil diffusion pump.
 - j) State two names of gauges used for vacuum measurement in U.H.V.
2. Attempt **any two** of the following :
- a) Explain construction and working of pirani gauge. **5**
 - b) Describe working of rotary pump. **5**
 - c) Explain principle and working of U-tube mercury manometer as a gauge. **5**



3. Attempt **any two** of the following :
- a) Explain the use of vacuum pump in laboratory and industry. **5**
 - b) Explain classification of vacuum systems. **5**
 - c) Explain the need of leak detection in vacuum system. **5**
4. A) Attempt **any one** of the following :
- a) Explain principle, construction and working of Bayard Alpert gauge. **8**
 - b) Explain principle, construction and working of oil diffusion pump. **8**
- B) Attempt **any one** of the following :
- a) How the leak detect in vacuum system ? **2**
 - b) Why O-rings or Cu-gaskets are needed in vacuum system ? **2**
-



T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – VI (L)) (Old) (2004 Pattern)
PH-336 : Lasers

Time : 2 Hours

Max. Marks : 40

- N.B.:* i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Use of calculator and log table is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What is metastable state ?
 - b) Define atomic absorption coefficient.
 - c) State any two applications of laser.
 - d) What is zero point energy in a laser ?
 - e) Name the active material used in Ruby laser.
 - f) Define unsaturated gain.
 - g) What is role of nitrogen in CO₂ laser ?
 - h) State the condition for population inversion.
 - i) Define coherence length.
 - j) State the basic principle of 'holography'.
2. Attempt **any two** of the following :
- a) Describe construction and working of He-Ne laser. **5**
 - b) Explain vibrational mode of resonator. **5**
 - c) Explain how laser is used in isotope separation. State the different fields in which lasers is used. **5**



3. Attempt **any two** of the following :

- a) Describe construction and working of CO₂ laser. 5
- b) Explain stimulated emission of radiation and optical pumping in laser. 5
- c) State basic principle and applications of dye-laser. 5

4. A) Attempt **any one** of the following :

- i) For a source radiating at mean wavelength of 6500 AU, having coherence time 4×10^{-8} sec. Deduce the order of magnitude of its (i) coherence length (ii) spectral width of line (iii) purity factor Q (Given $C = 3 \times 10^8$ m/s). 8
- ii) Derive threshold condition for laser. 8

B) Attempt **any one** of the following :

- a) State applications of laser in industry. 2
- b) What is laser fusion ? 2



[3817] – 723

T.Y.B.Sc. (Semester – III) Examination, 2010
BOTANY (Paper – III)
BO-333 : Biology of Seed Plants – I
(Angiosperms and Environmental Biology)
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *Draw neat labelled diagram wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- a) Give one merit of Takhtajan system of classification.
 - b) Give two examples of family Amaranthaceae.
 - c) Give one economic importance of family Asclepiadaceae.
 - d) Give floral formula of family Apiaceae.
 - e) What is artificial system of classification ?
 - f) Give any one role of national organization in environment.
 - g) What is ozone depletion ?
 - h) Give any two non-conventional energy sources.
 - i) What is endemism ?
 - j) Give one name of endangered plant species.
2. Answer **any two** of the following : **10**
- a) Give an outline of Engler and Prantl's system of classification and give its assumptions.
 - b) Give the distinguishing characters of family Cannaceae.
 - c) Write an account of Environment Protection Act.

P.T.O.



3. Write short notes on **any two** of the following : **10**

- a) Water pollution
- b) Environment impact assessment
- c) Caytoniales.

4. Give distinguishing character, floral formula, floral diagram and economic importance of family Magnoliaceae. **10**

OR

Describe non-conventional resources of energy and their management. **10**



[3817] – 726

T.Y. B.Sc. (Semester – III) Examination, 2010

BOTANY (Paper – VI)

**BO-336 : Botanical Techniques and Computer Applications (Old Course)
(2004 Pattern)**

Time : 2 Hours

Max. Marks : 40

Instructions.: i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Draw neat labelled diagrams wherever necessary.*

1. Answer the following : **10**
 - a) What is microscope ?
 - b) Give principle of centrifuge.
 - c) Define pH.
 - d) What is chromatography ?
 - e) Mention any two types of spectrophotometer.
 - f) What is ALU ?
 - g) Define GUI.
 - h) Which application software is used to prepare a document ?
 - i) What is LAN ?
 - j) Write any one website address of botanical interest.

 2. Answer **any two** of the following : **10**
 - a) Explain principle and working of a compound microscope.
 - b) Comment on the principle and working of TLC.
 - c) Describe the basic structure of a computer CPU.

 3. Write notes on (**any two**) : **10**
 - a) Tilak air sampler.
 - b) MS-Word.
 - c) Input devices.

 4. What is palynology ? Give its scope and importance. **10**
- OR
- What is operating system ? Give uses of taskbar, control pannel and clip board. **10**



[3817] – 732

T.Y. B.Sc. (Sem. – III) Examination, 2010
ZOOLOGY (Paper – VI) (2004 Pattern)
ZO – 336 : Biological Chemistry and Biotechniques
(Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Neat labelled diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Attempt the following : 10

- 1) Define buffer.
- 2) What is an aldose sugar ?
- 3) What are non-essential amino acids ?
- 4) Name any two fibrous proteins.
- 5) What is holoenzyme ?
- 6) What are Waxes ?
- 7) Mention any two sources of Vitamin A.
- 8) State any two functions of 'Mg'.
- 9) Name any two biomolecules.
- 10) Give any two applications of paper chromatography.

2. Attempt **any two** of the following : 10

- i) Explain the principle and applications of colorimetry.
- ii) What is enzyme inhibition ? Explain uncompetitive enzyme inhibition.
- iii) Explain the titration curve of amino acid.

P.T.O.



3. Write notes on **any two** : **10**
- a) Atherosclerosis
 - b) Effect of pH on enzyme activity
 - c) Structure of water
 - d) α -helix of protein.

4. What are carbohydrates ? Classify them with suitable examples. **10**

OR

Explain the sources, functions and significance of Vitamin C and Vitamin B. **10**



T.Y. B.Sc. (Semester – III) Examination, 2010

STATISTICS

(Principal) (Paper – IV)

ST-334 : Sampling Methods (2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) All questions are compulsory.

*2) Figures to the **right** indicate **full** marks.*

*3) Use of scientific calculator and statistical tables is **allowed**.*

4) Symbols and abbreviations have their usual meaning.

1. Attempt **each** of the following :

a) Choose the correct alternative in **each** of the following : (1 each)

i) Total number of possible samples of size n , drawn from population of size N by SRSWOR is

- A) N B) n C) $\binom{N}{n}$ D) N^n

ii) In SRSWOR, probability that specified unit is included in the sample of size n taken from a population of size N is

- A) $\frac{1}{N}$ B) $\frac{n}{N}$ C) $1 - \frac{n}{N}$ D) $\frac{1}{n}$

iii) In stratified random sampling with Neyman's optimum allocation the size of the sample from i^{th} stratum is

- A) $n_i = nP_i$ B) $n_i = \frac{n}{N}$
C) $n_i = np_i S_i$ D) $n_i = n \frac{p_i S_i}{\sum p_i S_i}$ where $p_i = \frac{N_i}{N}$

iv) The ratio estimator of population mean (\bar{Y}) is given by

- A) $\frac{\bar{x}}{\bar{y}} \bar{X}$ B) $\frac{\bar{y}}{\bar{x}} \bar{X}$ C) $\frac{\bar{x} \bar{y}}{\bar{X}}$ D) $\frac{\bar{X}}{\bar{x} \bar{y}}$



b) State whether **each** of the following statements is **true** or **false**. (1 each)

- i) In SRSWR, sample mean square s^2 is an unbiased estimator of population mean square S^2 .
- ii) Regression estimators are biased estimators but bias $\rightarrow 0$ as sample size $n \rightarrow \infty$.

c) Define the following terms : (1 each)

- i) Sampling unit
- ii) Sampling frame.

d) i) State any two advantages of sample survey over census. 1

ii) The following data give yield of paddy in 20 plots.

11, 27, 26, 24, 23, 21, 12, 29, 17, 21, 20, 25, 13, 21, 16, 19, 14, 20, 23, 20

List the observations in the systematic sample of size 5 from these observations if starting observation number is 2. 1

2. Attempt **any two** of the following : (5 each)

- a) In case of SRSWOR, prove that sample mean is an unbiased estimator of population mean. Further, prove that SRSWOR is more efficient than SRSWR in estimating population mean.
- b) In a population of 1000 units, population variance is 100. What should be the size of the sample selected by SRSWOR from this population so that 95% of the sample means may differ from population mean by not more than 0.5 ?
- c) State the requirements of good questionnaire.

3. Attempt **any two** of the following : (5 each)

- a) Explain the method of stratified random sampling. Obtain the formula for variance of an unbiased estimator of population mean in this case.
- b) Define regression estimator of population mean. State any two properties of this estimator. State the expression for variance of this estimator.
- c) What are nonsampling errors ? Describe in brief different sources of these errors.



4. Attempt **any one** of the following :

a) i) With usual notations, prove that

$$\text{Var}(\bar{x}_{st})_{\text{SRSWOR}} \geq \text{Var}(\bar{x}_{st})_{\text{P.A.}} \geq \text{Var}(\bar{x}_{st})_{\text{N.A.}}$$

if finite population correction (f.p.c.) is ignored.

6

ii) Derive the formula for sample size n, required for estimating population proportion when method of sampling is SRSWOR.

4

b) i) Explain the method of systematic sampling. Obtain the expression for variance of an unbiased estimator of population mean in this case.

5

ii) In stratified random sampling with given cost function of the form

$$C = C_0 + \sum_{i=1}^k c_i n_i$$

prove that $\text{Var}(\bar{x}_{st})$ is minimum if $n_i \propto \frac{N_i S_i}{\sqrt{c_i}}$.

5



[3817] – 750

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOGRAPHY (Paper – V)
Gg-335 : Geography of Soils
(2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the **right** indicate **full** marks.*
3) *Draw **neat** diagrams and maps **wherever** necessary.*
4) *Use of map-stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) List two major components of Soil.
 - b) What is the zone of illuviation ?
 - c) What is the difference between erosion and weathering ?
 - d) What is biological weathering ?
 - e) What is pedogenesis ?
 - f) Mention the natural importance of soil.
 - g) What are symbiotic bacteria ?
 - h) What is capillary action ?
 - i) What is carrying capacity of soil ?
 - j) What is meant by leaching ?
2. Write short answers (**any two**) : **10**
- a) Discuss and differentiate between litter and humus.
 - b) Discuss any three processes of chemical weathering.
 - c) What are azonal soils ?
3. Write short notes (**any two**) : **10**
- a) Porosity and infiltration.
 - b) Soil texture
 - c) Soil colour.
4. Write a brief note on nature of Soil Science. **10**

OR

What is meant by Cation and Anion exchange ? Compare and contrast.



[3817] – 754

T.Y. B.Sc. (Semester – III) Examination, 2010
Paper – III : MICROBIOLOGY (Old Course)
MB-333 : Enzymology and Biochemistry
(2004 Pattern)

Time : 2 Hours

Total Marks : 40

- N.B. : 1) All questions are compulsory.*
2) All questions carry equal marks.
3) Draw neat labelled diagram wherever necessary.

1. Attempt the following :

- a) Name any two materials used for packing column in molecular sieve chromatography.
- b) For determination of amino acids at active site of an enzyme by alkylation _____ reagent is used.
- c) Define specific activity of an enzyme.
- d) What is meant by fold purification ?
- e) Define isoenzymes.
- f) Define ligand and give one example.
- g) State true or false-Lipoic acid is a cofactor of the pyruvate dehydrogenase.
- h) Give two examples of zymogens.
 - i) What is solid shear method for disruption of cell ?
 - j) Name any two enzymes used for disruption of cells.

2. Attempt **any two** of the following :

- a) Explain covalent modification of an enzyme.
- b) Describe effect of pH and temperature on enzyme catalyzed reaction.
- c) Explain chemical modification of amino acid side chains as a method for determination of amino acids at active site of an enzyme.

P.T.O.



3. Attempt **any two** of the following :

- a) Describe any two types of feed back controls for enzyme regulation.
- b) Describe enzyme assay by manometry.
- c) Explain role of biotin as a coenzyme.

4. Attempt **any one** of the following :

- a) Enlist the types reversible inhibition and derive equation for competitive inhibition.

OR

- b) Explain enzyme purification by -
 - i) Ion exchange chromatography
 - ii) Solvent precipitation.



[3817] – 769

T.Y. B.Sc. (Semester III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS.No. 336 (A) : Strategic Thinkers
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
- 1) State the meaning of “Strategic Thoughts”.
 - 2) By whom the well known book – “On War” it was wrote ?
 - 3) Who was Moltke ?
 - 4) Define “Logistics”.
 - 5) Define “War”.
 - 6) What do you mean by trench warfare ?
 - 7) Define “Strategy”.
 - 8) State the basic aim of Tactics.
2. Answer in **8 to 10** sentences (**any two**) : **8**
- 1) How the principles of war came into existence ?
 - 2) Explain in brief the views of moltke on “Strategy”.
 - 3) What do you mean by classical thoughts ?
3. Write short notes on (**any two**) : **8**
- 1) Thoughts of Du-pieq.
 - 2) Changes made by Moltke in original schlieffen plan.
 - 3) Concept of deterrence.
4. Answer in **18 to 20** sentences (**any one**) : **8**
- 1) Explain the strategic thoughts of Jomini with special reference to the “Concept of Mass Army”.
 - 2) Highlight on any three principles of war as per clausewitz.

P.T.O.



T.Y. B.Sc. (Semester III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES
DS-336 (B) : International Law

Time : 2 Hours

Max. Marks : 40

N.B.: i) **All the questions are compulsory.**
ii) **Figures to the right indicate full marks.**

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Define international law.
 - 2) State the meaning of codification.
 - 3) What do you mean by U. N. sanction ?
 - 4) Explain, what are the subjects of international law ?
 - 5) Write any two duties at the states.
 - 6) What are the essential elements at a state ?
 - 7) State the meaning of neutral state.
 - 8) Explain, the meaning of true basis of international law.

 2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Explain Dynamism in law.
 - 2) Discuss need for universal international law.
 - 3) Establish relationship between U.N.O. Vs International law.

 3. Write short notes on **(any two)** : **8**
 - 1) Sources of international law.
 - 2) State responsibilities.
 - 3) Human rights Vs International law.

 4. Write in **16 to 20** sentences **each (any one)** : **8**
 - 1) Assess the work of the U.N.O. in the development of international law.
 - 2) Write a note on the role of U.N.O. in maintenance of international peace and security.
-



T.Y. B.Sc. (Semester III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES
DS-336 (C) : Refugee Studies

Time : 2 Hours

Max. Marks : 40

N.B.: i) *All questions are compulsory.*
ii) *Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Who is stateless person ?
 - 2) Define the term 'Refugee'.
 - 3) What is Asylum ?
 - 4) Define 'Extradition'.
 - 5) What is 'Convention' ?
 - 6) Who is POW ?
 - 7) Define 'Civil war'.
 - 8) What is human rights ?

2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Explain how displaced persons during war is treated ?
 - 2) Write the role of UN on refugees.
 - 3) Discuss international law on refugees.

3. Write short notes on (**any two**) : **8**
 - 1) Convention of 1951.
 - 2) Protocol of 1967.
 - 3) New thinking on refugee problem.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Discuss the international convention on war crimes.
 - 2) Explain the concept of extradition and discuss why extradition treaty is necessary.



[3817] – 774

T.Y. B.Sc. (Semester – III) Examination, 2010
ENVIRONMENTAL SCIENCE
ENV-332 (Old) Natural Resource Management
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions.:** 1) *All questions are compulsory.*
2) *Neat and labeled diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) What are mangroves ?
 - b) Define sustainable management.
 - c) Write major non-renewable natural resources.
 - d) What is eco-development ?
 - e) Define conservation.
 - f) Mention the important functions of ecosystem.
 - g) What is afforestation ?
 - h) What is biomass energy ?
 - i) Define restoration.
 - j) What is soil/land degradation ?
2. Write a short note on (**any two**) : **10**
- a) Mineral resources of India.
 - b) Causes of forest resource depletion.
 - c) Control measures for marine pollution.

P.T.O.



3. Answer **any two** from the following : **10**
- a) What are food resources ? Add a note on food resources of India.
 - b) Describe the consequences of ecosystem exploitation.
 - c) What is ecosystem productivity ? Add a note on productivity of marine environment.
4. Attempt **any one** of the following questions : **10**
- a) Explain the concept of ecosystem with its characteristics and describe the consequences of ecosystem exploitation.
 - b) What is sustainable ecosystem management ? Explain the need for sustainable management of the ecosystem.



[3817] – 781

T.Y. B.Sc. (Semester – III) Examination, 2010
STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION – V
(Vocational)
(Old Course) (2004 Pattern)
Fundamentals of Communication and Propagation

Time : 2 Hours

Max. Marks : 40

Instructions : 1) All questions are compulsory.

2) Draw neat and labeled diagrams wherever necessary.

3) Figures to the right indicate full marks.

1. Answer the following questions in brief. (2×6=12)

1) What is modulation index ? Give its range for Analog modulation.

2) Why synchronization of commutator is necessary for transmitter and receiver ?

3) Explain necessity of nonlinear device for modulation.

4) Define Nyquist criteria and give its importance.

5) What is digital modulation ? Give its examples.

6) Explain needs of modulation techniques.

2. Explain the following (**any two**) : (2×4=8)

A) Draw frequency spectrums of PAM, PWM and PPM.

B) Comment on the power requirements of DSB, SSB and VSB.

C) Why SSB Transmission is preferred than DSB Transmission ?

P.T.O.



3. Explain the following (**any two**): **(2×4=8)**

- A) Draw AM waveforms for modulation index of 0.5, 1 and 0.
- B) What is analog pulse modulation ? Explain difference with digital modulation.
- C) What is sampling ? Explain its significance in detail.

4. Explain the following (**any two**): **(2×6=12)**

- A) What is Transmission Line ? Explain coaxial cable with the schematic diagram.
Give advantages and disadvantages of flat cable and coaxial cable.
- B) What is PCM ? Explain Telephony concept with the help of multiplexer.
- C) A modulating signal $5 \sin(2\pi \times 10^3 t)$ is used to modulate a carrier signal $10 \sin(2\pi \times 10^4 t)$. Find percentage of modulation, side band frequencies, bandwidth and amplitudes of sidebands.



[3817] – 784

T.Y. B.Sc. (Semester – III) Examination, 2010
COMPUTER SERVICE MANAGEMENT (2004 Pattern) (Old)
Computer Maintenance – V (Vocational)

Time : 2 Hours

Max. Marks : 40

1. Answer the following in **one/two** sentences. **(10×1=10)**
 - a) Which type of recording technique is used in Hard disk drive ?
 - b) List basic CD-Drive components.
 - c) What is logical partition in Hard disk ?
 - d) List any two portable systems.
 - e) Write any two differences between desktop PC and note book computer.
 - f) Define operating system.
 - g) Classify DOS commands.
 - h) State any two GUI operating systems.
 - i) What is maximum data transfer rate is possible through telephone line ?
 - j) List any two Add-on cards.

2. Answer **any two** of the following : **(2×5=10)**
 - a) Discuss any two interfacing standards of hard disk drives.
 - b) Explain the various problems related to CD-drive.
 - c) List various system components of note book computer and discuss any one in brief.

3. Answer the following (**any two**) : **(2×5=10)**
 - a) Discuss the features of any one GUI operating system.
 - b) Write a short note on sound card.
 - c) List various devices connected to USB and explain USB in brief.

4. Answer **any one** of the following : **(1×10=10)**
 - a) Explain the Desktop of Windows 2000 and Windows 98.
 - b) Discuss various problems associated with MODEM and AGP card. Discuss probable solutions for it.



[3817] – 789

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC EQUIPMENT MAINTENANCE (Paper – VI)
Vocational-EEM-336
Electronic Instrumentation (Old)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. a) Answer the following : (4×1=4)
- i) Define 'Loading error'.
 - ii) State any 2 calibration techniques.
 - iii) State full-forms of – ADC, DAC.
 - iv) State any 2 static performance characteristics of an instrument.
- b) Answer the following : (2×2=4)
- i) Compare null type instrument with deflection type instrument.
 - ii) Explain 'systematic error'.
- c) Answer the following : (2×2=4)
- i) What is primary calibration ?
 - ii) State any 2 blocks of signal conditioning element in an instrumentation system.
2. Answer the following (**any 2**) : (2×4=8)
- i) Write a short note on 'photo-conductive' transducer.
 - ii) Discuss 'relative motion device'.
 - iii) Explain 'absorption dynamometer'.

P.T.O.



3. Answer the following (**any 2**) : (2×4=8)

- i) What is 'torque' ? Explain relation between 'Power' and 'Torque'.
- ii) Discuss 'moderate pressure measurement'.
- iii) Explain any one electrical method for temperature measurement.

4. Answer the following. (2×6=12)

- i) Explain calibration process of motion measuring devices.
- ii) Write an account of quantity flow meter.

OR

4. Solve the following. (2×6=12)

- i) For a certain thermistor $\beta = 3140 \text{ K}$ and at 27°C its resistance is 1050Ω .
What will be the temperature when thermister's resistance is 2330Ω ?
- ii) In a seismic instrument, mass (m) is 100 gm, spring stiffness is 1N/mm, damping ratio is 0.4. Find the amplitude of recorded motion, if the motion to be measured is $= (3\sin 200t)\text{mm}$.



[3817] – 701

T. Y. B.Sc. (Semester – III) Examination, 2010
MATHEMATICS (Paper – I) (Old Course)
MT – 331 : Metric Spaces (2004-Pattern)

Time: 2 Hours

Max. Marks: 40

N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Attempt **each** of the following :

10

- i) Show that $[0, 1]$ and $[3, 6]$ are equivalent sets.
- ii) Show that the set of all even integers is a countable set.
- iii) If $A = \left\{ \frac{1}{n} / n \in \mathbb{N} \right\} \subset \mathbb{R}^1$, then find \bar{A} .
- iv) Give an example of a totally bounded subset of \mathbb{R}^2 which is not compact.
- v) Show that $(0, 1)$ is a disconnected subset of \mathbb{R}_d .
- vi) Give an example of a subset of \mathbb{R}^2 which is neither open nor closed.
- vii) If $A = [0, 1]$ is a metric space with metric $\rho(x, y) = |x - y|$, then find $B_A [0.9, 0.5]$.
- viii) Show that the set of integers Z is a nowhere dense subset of \mathbb{R}' .
- ix) Give an example of a closed subset of \mathbb{R}' which is not connected.
- x) If $A = \{1, 2, 3, 4\} \subset \mathbb{R}_d$, then find $\text{diam. } A$.

2. Attempt **any two** of the following :

10

- i) If B is an infinite subset of a countable set A , then prove that B is countable.
- ii) If G_1 and G_2 are open subsets of a metric space (M, ρ) , then prove that $G_1 \cap G_2$ is an open subset of M .
- iii) Let G be an open subset of \mathbb{R}' . Prove that the characteristic function χ_G is continuous at each point of G .

P.T.O.



3. Attempt **any two** of the following : **10**
- i) If A and B are sets of the first category, then prove that $A \cup B$ is of the first category.
 - ii) If A and B are closed subsets of \mathbb{R}^1 , prove that $A \times B$ is a closed subset of \mathbb{R}^2 .
 - iii) Let f be a continuous function from a metric space M_1 into a metric space M_2 . If M_1 is connected, then prove that the range of f is connected.
4. Attempt **any one** of the following : **10**
- i) a) Prove that a subset A of the metric space (M, ρ) is totally bounded if and only if, for every $\varepsilon > 0$, A contains a finite ε – dense subset.
b) Let $\langle M, \rho \rangle$ be a complete metric space. For each $n \in \mathbb{N}$ let F_n be a closed bounded subset of M such that $F_n \supset F_{n+1}$, $\forall n$ and $\text{diam. } F_n \rightarrow 0$ as $n \rightarrow \infty$, then prove that $\bigcap_{n=1}^{\infty} F_n$ contains precisely one point.
 - ii) a) If $\langle M_1, \rho \rangle$ is a compact metric space, then prove that any sequence of points in M has a convergent subsequence.
b) If $f : (M_1, \rho_1) \rightarrow (M_2, \rho_2)$ is a bijective continuous function and M_1 is a compact metric space, then prove that ‘ f ’ is a homeomorphism of M_1 onto M_2 .



T.Y.B.Sc. (Semester – III) Examination 2010
Paper – II : MATHEMATICS
MT – 332 : Real Analysis – I
(2004 Pattern) (Old Course)

Time: 2 Hours

Max. Marks: 40

N.B. : i) All questions are compulsory.
ii) Figures to the right indicate full marks.

1. Attempt **each** of the following :

10

i) If $\{S_n\}_{n=1}^\infty = \left\{ \frac{1}{n} \right\}_{n=1}^\infty$ and $\{n_k\}_{n=1}^\infty = \{k^2\}_{k=1}^\infty$ then find S_{n_3} .

ii) If $\{|S_n|\}_{n=1}^\infty$ converges to 0, then prove that $\{S_n\}_{n=1}^\infty$ also converges to 0.

iii) Find the limit superior of the sequence

1, - 1, 1, - 2, 1, - 3,

iv) Test the convergence of series $\sum_{n=1}^\infty \cos\left(\frac{\pi}{n}\right)$.

v) Define conditional convergence of a series of real numbers.

vi) Discuss the convergence of the series $\sum_{n=1}^\infty \frac{1+n}{1+n^2}$.

vii) State true or false with justification. The sequence $\left\{ \frac{1}{\sqrt{n}} \right\}_{n=1}^\infty$ is in l^2 .

viii) Let $f(x) = x(0 \leq x \leq 1)$ and $\delta = \left\{ 0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1 \right\}$ be partition of $[0, 1]$, compute $L[f, \delta]$.

ix) State the first mean value theorem of integral calculus.

x) Let f be function on $[0, 1]$ defined by $f(x) = \begin{cases} 1; & x \text{ is rational} \\ 0; & x \text{ is irrational} \end{cases}$

Find $\int_0^{-1} f$.



2. Attempt **any two** of the following :

10

i) If $\{S_n\}_{n=1}^{\infty}$ is sequence of real numbers such that $\limsup_{n \rightarrow \infty} S_n = \liminf_{n \rightarrow \infty} S_n$ then prove that $\{S_n\}_{n=1}^{\infty}$ is convergent.

ii) Define Cauchy sequence. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence of real numbers and for each $n \in I$ let $S_n = a_1 + a_2 + \dots + a_n$, $t_n = |a_1| + \dots + |a_n|$. prove that if $\{t_n\}_{n=1}^{\infty}$ is Cauchy sequence then so is $\{S_n\}_{n=1}^{\infty}$.

iii) Show that sequence $\{S_n\}_{n=1}^{\infty}$ where

$$S_n = \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n} \text{ is convergent.}$$

3. Attempt **any two** of the following.

10

i) Let $\sum_{n=1}^{\infty} a_n$ be a series of non-negative numbers with $S_n = a_1 + a_2 + \dots + a_n$ ($n \in I$), prove that

a) $\sum_{n=1}^{\infty} a_n$ converges if the sequence $\{S_n\}_{n=1}^{\infty}$ is bounded.

b) $\sum_{n=1}^{\infty} a_n$ diverges if the sequence $\{S_n\}_{n=1}^{\infty}$ is not bounded.

ii) State Cauchy condensation test for convergence of series of real numbers and

use it to test the convergence of $\sum_{n=1}^{\infty} \frac{1}{n^x}$.

iii) Discuss the convergence of following series

a) $\sum_{n=0}^{\infty} \frac{n^4}{n!}$

b) $\sum_{n=1}^{\infty} \frac{\left(1 + \frac{1}{n}\right)^{zn}}{e^n}$



4. Attempt **any one** of the following :

10

i) a) If the function f is Riemann integrable on $[a, b]$ and $c \in (a, b)$ then prove

that ' f ' is Riemann integrable on $[a, c]$ and $[c, b]$ and $\int_a^b f = \int_a^c f + \int_c^b f$. **7**

b) Evaluate $\lim_{n \rightarrow \infty} \left[\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n} \right]$. **3**

ii) a) If ' f ' is continuous on closed and bounded interval $[a, b]$ and

$F(x) = \int_a^x f(t) dt$ ($a \leq x \leq b$) then prove that $F'(x) = f(x)$ ($a \leq x \leq b$).

b) Prove that

$$\int_0^{\pi/2} \frac{x}{\sin x + 2 \cos x} dx \geq \frac{\pi^2}{8\sqrt{5}}$$



[3817] – 706

T.Y.B.Sc. (Semester – III) Examination, 2010
MATHEMATICS (Paper – VI)
MT – 336 : Problem Course Based on MT-334 and MT-335
(2004 Pattern : Old Course)

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*
2) Figures to the right indicate full marks.
3) Answers to the two Sections should be written in separate answer books.

SECTION – I
(Group Theory)

1. Attempt **each** of the following :

5

- i) Give an example of an abelian group which is not cyclic.
- ii) Show that the subgroup $H = \{\rho_0, \mu_1 = (2, 3)\}$ is not normal in S_3 .
- iii) Write index of the subgroup $H = (2, \mathbb{Z}, +)$ in the group $(\mathbb{Z}, +)$.
- iv) Give example of subgroups H, K of the group $G = (\mathbb{R}, +)$ such that HUK is not a subgroup of G .
- v) Write the inverse of the permutation $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & 4 \end{pmatrix} \in S_4$.

2. Attempt **any two** of the following :

10

- i) Let (G, \cdot) be a group and $Z = \{a \in G / ag = ga, \forall g \in G\}$. Show that Z is a subgroup of G .
- ii) If H is a subgroup of a group G and N is a normal subgroup of G , show that $H \cap N$ is a normal subgroup of H .
- iii) Let G be the group of nonzero real numbers w.r.t. multiplication. Define $\phi = G \rightarrow G$ as $\phi(x) = x^2$. Show that ϕ is a homomorphism. Find Kernel ϕ .

P.T.O.



3. Attempt **any one** of the following :

5

- i) For any $n > 2$ construct a nonabelian group of order $2n$.
- ii) In S_3 show that there are four elements satisfying $x^2 = e$ and three elements satisfying $y^3 = e$.

SECTION – II

(Dynamics)

1. Attempt **each** of the following :

5

- i) A body with mass of 250 grams is accelerated at 6m/sec^2 . What force is acting on it ?
- ii) A ball is thrown vertically upwards with velocity of 30 m/sec. How high will it go ?
- iii) A particle moves along a straight line and its position referred to a fixed point on the line is given by $x = c + a \cos wt$, where c and w are constants. Show that motion is simple harmonic motion.
- iv) Find the direction of the resultant velocity of moving particle if $u = 3$, $v = 4$, $\alpha = 30^\circ$.
- v) Show that the force $\vec{F} = xi + yj + zk$ is conservative.

2. Attempt **any two** of the following :

10

- i) Prove that if the time of flight of a bullet over a horizontal range R is T seconds, the inclination of the velocity of projection to the horizontal is

$$\tan^{-1} \left(\frac{gT^2}{2R} \right).$$

- ii) A body starts from rest and travels a distance 150 meters in 8th second, calculate its acceleration.
- iii) A particle moves in a straight line with uniform acceleration and its distances from the origin O on the line (not necessarily the position at $t = 0$) at times t_1, t_2, t_3 are d_1, d_2, d_3 respectively. Prove that if t_1, t_2, t_3 form an A.P., where common difference is d and d_1, d_2, d_3 are in G.P. then the acceleration is

$$\left(\frac{\sqrt{d_1} - \sqrt{d_3}}{d^2} \right)^2.$$



3. Attempt **any one** of the following :

5

i) A uniform elastic string has length a_1 when the tension is T_1 and a length a_2 when tension is T_2 . Show that its natural length is $\frac{a_2 T_1 - a_1 T_2}{T_1 - T_2}$.

ii) The velocities of a particle along and perpendicular to the radius vector from a fixed origin are given as λr and $\mu \theta$ where λ and μ are constants. Show that the components of acceleration along and perpendicular to the radius vector are $\lambda^2 r - \frac{\mu^2 \theta^2}{r}$ and $\mu \theta \left(\lambda + \frac{\mu}{r} \right)$ respectively.

T.Y.B.Sc. (Semester – III) Examination, 2010
MATHEMATICS (Paper – VIII)
(2004 Pattern) (Old Course)

MT 338(A) : Number Theory

MT 338(B) : Differential Geometry – I

MT 338(C) : Computational Mathematics – III

MT 338(D) : Astronomy – I

Time : 2 Hours

Max. Marks : 40

- Note :*
- 1) Candidates are advised to see the **relevant** question paper and solve the same.
 - 2) Use of logarithmic tables and calculators is **allowed**.
 - 3) All questions are **compulsory**.
 - 4) Figures to the **right** indicate **full** marks.

MT – 338(A) : Number Theory

1. Attempt **each** of the following :

10

- i) If $(a, b) = 1$, then find $(a + b, a - b)$.
- ii) Prove that $n^6 - a^6$ is divisible by 7, if n and a are prime to 7.
- iii) Give an example of an identical congruence.
- iv) Find the smallest positive integer (except $x = 1$) that satisfies the following congruences simultaneously $x \equiv 1 \pmod{3}$, $x \equiv 1 \pmod{5}$, $x \equiv 1 \pmod{7}$.
- v) Find the number of solutions for $x^8 \equiv 1 \pmod{17}$.
- vi) If x and y are odd integers, then show that $4 \nmid (x^2 + y^2)$.
- vii) For what real numbers x , is it true that $[x] + [x] = [2x]$.
- viii) Find $\mu(101) \cdot \mu(102) \cdot \mu(103) \cdot \mu(104)$.
- ix) If $ax + by = c$ is solvable and $(a, b) = 3$ then what is (a, b, c) .
- x) If x, y, z is a primitive Pythagorean triplet then show that both x, y cannot be even integers.

P.T.O.



2. Attempt **any two** of the following : **10**
- i) If a, b are any integers, with $a > 0$, show that there exist unique integers g and r such that $b = ga + r$, $0 \leq r < a$.
 - ii) Prove that there are infinitely many primes of the form $4n + 3$.
 - iii) Find all solutions of the congruence $57x \equiv 87 \pmod{105}$.
3. Attempt **any two** of the following : **10**
- i) State and prove Wilson's theorem.
 - ii) Reduce the congruence $x^{20} + x^{13} + x^7 + x \equiv 2 \pmod{7}$ to an equivalent congruence of degree ≤ 6 .
 - iii) If c has order $h \pmod{m}$, d has order $k \pmod{m}$ and $(h, k) = 1$, then show that cd has order $hk \pmod{m}$.
4. Attempt **any one** of the following : **10**
- i) a) Show that $\sum_{d|n} \phi(d) = n$, for every positive integer n .
 - b) Let u and v be positive integers whose product uv is a perfect square and let $g = (u, v)$. Show that there exists positive integers r, s such that $u = gr^2$ and $v = gs^2$.
 - ii) a) Let a, b, c be positive integers with a and b not both 0 and $g = (a, b)$ show that the equation $ax + by = c$ has, no solution if $g \nmid c$ and has infinitely many solutions if $g|c$. If (x_1, y_1) is one integral solution of the equation $ax + by = c$ then all other solutions are of the form $x = x_1 + \frac{kb}{g}$, $y = y_1 - \frac{ka}{g}$, where k is an integer.
 - b) Find the highest power of 6 dividing $533!$.
-



MT 338(B) : Differential Geometry – I

Time : 2 Hours

Max. Marks : 40

*N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.*

1. Attempt the following : **10**

- i) Define curvature and skew-curvature.
- ii) State any two properties of a developable surface.
- iii) Show that for any curve $\vec{t} \cdot \vec{b}' = -k\tau$.
- iv) Define Ruled surface.
- v) State under what conditions a given curve is a helix.
- vi) Find the envelope of the plane $5xt^2 - 4yt + 2z = t^3$.
- vii) Define central point and the line of striction.
- viii) Give the formulae for curvature and torsion of the spherical indicatrix of the tangent.
- ix) Obtain equation of tangent plane to the surface $z = x^2 + y^2$ at the point $(1, -1, 2)$.
- x) Show that the distance between corresponding points of two involutes is a constant.

2. Attempt **any two** of the following : **10**

- i) Find the curvature and torsion of the helix $x = a \cos u, y = a \sin u, z = a \tan \alpha$.
- ii) If a curve lies on a sphere show that ρ and σ are related by $\frac{d}{ds}(\sigma\rho') + \frac{\rho}{\sigma} = 0$.
- iii) Show that the spherical indicatrix of a curve is a circle if and only if the curve is a helix.



3. Attempt **any two** of the following :

10

- i) Show that the line $x = 3t^2z + 2t(1 - 3t^4)$, $y = -2tz + t^2(3 + 4t^2)$ generates a skew surface.
- ii) Find the condition that the surface $z = f(x, y)$ may represent a developable surface.
- iii) If R is the radius of spherical curvature, show that $R = \left| \frac{\bar{t} \times \bar{t}''}{k^2 \tau} \right|$.

4. Attempt **any one** of the following :

10

- i) Define the spherical indicatrix of the tangent. Also deduce the curvature and torsion of the spherical indicatrix of the tangents.
 - ii) a) Define 'Bertrand curve' and show that the angle between corresponding tangent lines to two Bertrand curves is a constant.
b) Find the equation to the developable surface which has $x = 6t$, $y = 3t^2$, $z = 2t^3$ as its edge of regression.
-



MT 338(C) : Computational Mathematics – III

Time : 2 Hours

Max. Marks : 40

*N.B. : 1) All questions are compulsory.
2) Use the following numerical equivalent for the English alphabet $a \leftrightarrow 1, b \leftrightarrow 2, c \leftrightarrow 3, \dots, z \leftrightarrow 26$.*

1. Attempt **each** of the following : **10**

- i) Evaluate the sum $(123)_7 + (123)_7$.
- ii) Find the remainder, when 5^{38} is divided by 11.
- iii) Give an example of a field containing 9 elements.
- iv) Find $\phi(200)$.
- v) Assume an additive cipher with key = 4. On English alphabet, what would be the ciphertext letter corresponding to the plain text letter a.
- vi) Assume a multiplicative cipher with key = 5 on the English alphabet, what would be the plaintext letter corresponding to the cipher text letter s.
- vii) Find all solutions of the congruence $2x \equiv 3 \pmod{11}$.
- viii) State why the following congruence has no solution $4x \equiv 1 \pmod{8}$.
- ix) Prove that $f(n) = 3n^5 + n^2 + 3$ is of $O(n^5)$.
- x) Define Encryption.

2. Attempt **any two** of the following : **10**

- i) Find an upper bound for the number of bit operations required to compute $n!$.
- ii) Convert the following plaintext message to ciphertext using keyword cipher with key word ‘mathematics’ and the key letter ‘f’.
“Pune university”
- iii) In the base 26, with digits A – Z representing 0 – 25. Multiply ‘YES’ by ‘NO’.



3. Attempt **any two** of the following : **10**

- i) Find the smallest positive integer which leaves a remainder of 1, 3, 3 when divided by 11, 12, 13 respectively.
- ii) Enchipher the following message by using multiplicative cipher with key = 17.
“It was disclosed yesterday”.
- iii) Decipher the following message, which was encrypted using an additive cipher, with key = 19.

“PXPXKXENVDRUXVTNLXHYMXGMAXYKXI
NXGVRFXMAHWGXXWLEHGZXXKUBIAXKMXQM”

4. Attempt **any one** of the following : **10**

- i) Using frequency analysis, decipher the following message, which was encrypted using a multiplicative cipher.

“VYU XOX SJY YTS FXV OWM YFQ GCQ PPY CQP OFD YQJ ODW
PRT SEQ”

- ii) Decipher the following message, which was encrypted by using an affine cipher.

“KEM	YGV	VEM	VHK	AWK	YZK	FWG
RKF	MSJ	JZG	XOJ	MEM	DJZ	MAM
SCJ	GKF	EJK	TSF	GJI	STM	ZSW
MKF	MEJ	KBS	XGJ	SFH	PMJ	JIK
FME	JKR	MSZ”				



MT 338(D) : Astronomy – I

Time : 2 Hours

Max. Marks : 40

*N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.*

1. Attempt **each** of the following : **10**

i) In spherical ΔABC , state cotangent formula.

ii) In equilateral ΔABC , show that $2 \cos \frac{a}{2} \sin \frac{A}{2} = 1$.

iii) In a spherical ΔABC , if $\angle C = \frac{\pi}{2}$, then prove that

$$\cos C = \cot A \cot B.$$

iv) State any one of Napier's analogy.

v) Define hour angle of star X.

vi) State the condition for twilight to last all night.

vii) Define Zenith.

viii) State any one law of refraction.

ix) State Bradley's formula for refraction.

x) State cosine rule for a spherical ΔABC .

2. Attempt **any two** of the following : **10**

i) State and prove sine rule for spherical triangle ABC.

ii) If $b + c = \pi$, show that $\sin 2B + \sin 2C = 0$.

iii) In a right angled triangle, if α be the length of the arc drawn from C perpendicular to the hypotenuse AB, show that $\cot^2 \alpha = \cot^2 a + \cot^2 b$.



3. Attempt **any two** of the following :

10

- i) Explain any one of the co-ordinate systems used in astronomy.
- ii) If a is the Sun's altitude in the prime vertical at a place in latitude ϕ and L is its longitude, prove that $\phi = \sin^{-1}(\sin L \sin \epsilon \operatorname{cosec} a)$.
- iii) If ϕ be the latitude, δ the declination of a star and H its hour angle, when rising or setting, show that

$$2 \cos^2 \frac{H}{2} = \sec \phi \sec \delta \cos(\phi + \delta).$$

4. Attempt **any one** of the following :

10

- i) Obtain the expression for Simpson's hypothesis.
- ii) a) With usual notations prove that $\frac{dz}{dH} = 15'' \sin A \cos \phi$.

where z is expressed in seconds of arc.

- b) If in the atmosphere the index of refraction vary inversely as the square of the distance from the earth's centre, being μ_0 at the earth surface, show that the corresponding correction for refraction is given by

$$\sin\left(\xi + \frac{R}{2}\right) = \sqrt{\mu_0} \sin \xi.$$



[3817] – 710

T.Y. B.Sc. (Semester – III) Examination, 2010
PHYSICS (Paper – II) (Old) (2004 Pattern)
PH – 332 : Classical Electrodynamics

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculator is allowed.*

1. Attempt **all** of the following (1 mark each) : **10**

- a) Define the term ‘surface charge density’.
- b) What do you mean by ‘unpolarized wave’ ?
- c) What is ‘polar molecule’ ?
- d) State Faraday’s law of electromagnetic induction.
- e) Give Poisson’s equation.
- f) Define the term ‘magnetization \vec{M} ’.
- g) Define ‘magnetic susceptibility’.
- h) Explain the term ‘magnetic dipole moment’.
- i) A dielectric material has dielectric constant $k = 4$. Find the magnitude of polarization \vec{P} if $D = 2.4 \times 10^{-7} \text{ C/m}^2$.
- j) In free space two point charges interact with a force of $1.6 \times 10^{-3} \text{ N}$. What would be the force if they were in dielectric medium having $k = 2$?

2. Attempt **any two** :

- a) Define the term ‘polarization \vec{P} ’. Obtain the relation between three electric field vectors \vec{E} , \vec{P} and \vec{D} . **5**
- b) State Amperes circuital law. Using this law obtain the relation $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$. **5**
- c) State law of conservation of charge. Obtain the equation of continuity $\vec{\nabla} \cdot \vec{J} + \frac{\partial \rho}{\partial t} = 0$. **5**

P.T.O.

3. Attempt **any two** :

- a) Three point charges $3q$, $-2q$, and $5q$ are placed at the corners of an equilateral triangle having length of each side equal to 1.5 m. Compute the potential energy of the structure. 5
- b) In air medium two long parallel wires carry current of 40 A each in the same direction. If they are separated by a distance of 2.5 cm, calculate force per unit length of the wire. 5
- c) On the surface of earth average energy reaching from sun in summer is 1450 J/sec. m^2 . Find the maximum values of \vec{E} and \vec{B} fields for sun light at the earth. 5

4. A) Attempt **any one** :

- 1) Define the term 'electrical image'. A point charge 'q' is placed at a perpendicular distance 'd' from infinite grounded conducting plane. Obtain the expressions for electric potential and field at any point near it. 8
- 2) Write Maxwell's equations in integral and differential forms. State the laws governing these equations. Also give physical significance of each equation. 8

B) Attempt **any one** :

- 1) A slab of dielectric material is placed in electric field $E_0 = 2 \times 10^3 \text{ V/m}$. Electric field inside the material is $E = 0.8 \times 10^3 \text{ V/m}$. Find dielectric constant 'k' of the material. 2
- 2) For a single EM wave reaching the earth from sun has maximum value of \vec{E} field $E_0 = 1.01 \times 10^3 \text{ V/m}$. Find the maximum value of \vec{H} field (H_0). 2



[3817] – 720

T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – VI)
CH – 336 (A) : Nuclear Chemistry
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) All questions are *compulsory*.
2) Figures to the *right* indicate *full* marks.
3) **Draw** the diagrams *wherever* necessary.
4) *Use* of logtables and calculator is *allowed*.

1. Answer the following : **10**

a) Which of the following nuclides is least likely to be stable ?



b) What is mass defect ? What is the relation between binding energy and mass defect ?

c) What is the value of separation factor at steady state ?

d) State the principle of chemical exchange method.

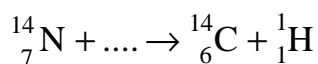
e) Define Decay constant. What is the unit of decay constant ?

f) Which are the two α active nuclides ?

g) State two applications of semi-empirical binding energy equation.

h) Define photonuclear reaction.

i) Complete the following nuclear reaction



j) What is reaction cross section ? What is the unit of reaction cross section ?

2. A) Attempt **any two** of the following : **6**

a) Discuss the principle of gaseous diffusion method used for the separation of isotopes.

b) Explain Bethe's notation. What are the different types of nuclear reactions ?

c) What are quarks ? Explain different types of quarks with respect to mass and charge.

P.T.O.



B) Answer **any two** of the following :

4

a) Calculate the binding energy of $^{16}_8\text{O}$ atom

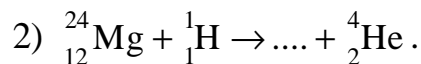
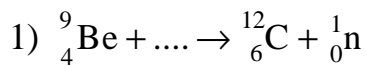
Given : mass of proton = 1.0078 amu

mass of neutron = 1.0087 amu

mass of ^{16}O = 15.9949 amu

b) Explain conservation of protons and neutrons in nuclear reaction with suitable examples.

c) Complete the following nuclear reaction.



3. Answer **any two** of the following :

10

a) What is half life and average life ? Show that radio active decay follows first order kinetics.

b) What is compound nucleus ? Discuss the important features of compound nucleus theory.

c) State and explain semi-empirical binding energy equation.

4. A) Discuss the nuclear shell model and give its important features.

6

OR

A) Discuss liquid drop model in detail giving postulates.

6

B) Explain Electromagnetic method for separation of radioisotopes with suitable example.

4

OR

B) Half life period of Radio element is 18.6 days. Calculate the time required during which 80% of the radionuclide is disintegrated ?

4



T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – VI)
CH – 336 (B) : Polymer Chemistry
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) All questions are *compulsory*.
2) Figures to the *right* indicate *full* marks.
3) **Draw** the diagrams *wherever* necessary.
4) *Use* of logtable/calculator is **allowed**.

1. Answer the following : **10**
- i) Define the term – Degree of polymerisation.
 - ii) Draw the structures of the following polymers
 - a) Polypropylene
 - b) Nylon – 6, 6.
 - iii) Give any three applications of PVC.
 - iv) Choose the correct alternative in the following :
J.W. Hyatt invented _____ polymer. (cellophane, celluloid)
 - v) State whether the following statement is **true** or **false** :
Polymeric materials are creating major pollution problem.
 - vi) Give any two initiators used in anionic polymerisation.
 - vii) Calculate molecular weight of polybutadiene polymer whose degree of polymerisation is 710.
 - viii) Write the IUPAC name of $(\text{Et})_3\text{SiMe}$.
 - ix) Name any two commonly used stabilizers.
 - x) Draw the structures of the following monomers.
 - a) Adipic acid
 - b) Vinyl acetate.
2. A) Explain the following (**any two**) : **6**
- i) Babcol is used in plywood industries.
 - ii) Fillers are of ten used for making polymeric articles.
 - iii) Polymer molecular weight is always expressed as an average.



B) How will you distinguish between the following (**any two**) :

4

- i) Linear and cross-linked polymers
- ii) Plastic and synthetic fibre
- iii) Organic and inorganic polymers.

3. Attempt **any two** of the following :

10

- i) Discuss in brief the mechanism of cationic polymerisation.
- ii) Give an account of viscometric method used for determination of polymer molecular weight.
- iii) Write short note on – Ziegler-Natta Catalyst.

4. A) Answer **any two** of the following :

6

- i) A polymer sample contains the fractions A, B, C and D with their number and molecular weights as shown below :

Fraction A – 150 molecules with molecular weights 2000

Fraction B – 250 molecules with molecular weight 1500

Fraction C – 300 molecules with molecular weight 2500

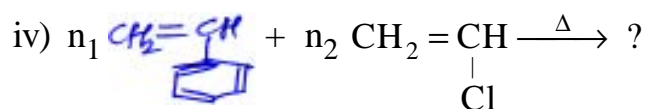
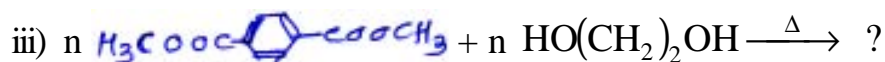
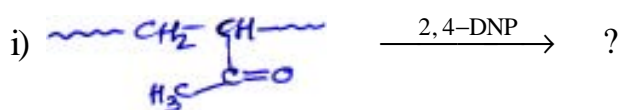
Fraction D – 100 molecules with molecular weight 1000

Calculate the number-average (\bar{M}_n) and weight-average molecular weight (\bar{M}_w) for the polymer sample.

- ii) Explain the stress-strain curve and properties of polymeric materials.
- iii) Explain the role of colourants and plasticizers during polymer processing.

B) Complete the following polymer reactions :

4





T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – VI)
CH – 336 (C) : Bio-Chemistry
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions : i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) **Draw the diagrams wherever necessary.**

I. Answer the following : **10**

- 1) Define the term epimers.
- 2) Give one example of transferase class of enzymes.
- 3) Name two Sulphur containing amino acids.
- 4) Give structure of Glutamic acid.
- 5) Name two hexoses.
- 6) Define, active site of enzyme.
- 7) Give significance of k_m .
- 8) What is optimum pH ?
- 9) Name monosaccharide units present in sucrose.
- 10) What is a dipeptide ?

II. A) Attempt **any two** : **6**

- 1) Discuss structure and function of mitochondria.
- 2) Discuss physical properties of amino acids.
- 3) Discuss separation of proteins from small molecular weight substances.

B) Give structures of following peptides (**any two**) : **4**

- 1) Gly – Phe – Pro – Asp
- 2) Tyr – Lys – Asp – Val
- 3) Phe – Val – Ala – Glu.



III. Answer the following (**any two**) : **10**

- 1) Discuss tertiary conformation of proteins.
- 2) Discuss classification of Carbohydrates.
- 3) Write note on biologically active peptides.

IV. A) What is enzyme inhibition ? Discuss reversible competitive inhibition. **6**

OR

A) Give detail account on hormones.

B) Describe structure of plant cell. **4**

OR

B) Give the following reactions :

- 1) FDNB reaction
 - 2) Phenyl isothiocyanate.
-



T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – VI)
CH – 336 (D) : Environmental Chemistry
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions : i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following questions in short. **10**
- i) What is the relationship between PPb and PPt ?
 - ii) What is humin ?
 - iii) What is total hardness of water ?
 - iv) Name the segments of atmosphere.
 - v) Define 'primary pollutants'.
 - vi) What is chemical speciation ?
 - vii) What is TLV ?
 - viii) Define 'reducing smog'.
 - ix) What is COD ?
 - x) Define receptor with suitable example.
2. a) Attempt **any two** of the following : **6**
- i) 'Role of stratosphere' explain.
 - ii) 'Role of dissolved oxygen in water' – explain.
 - iii) What is the effect of air pollutants on corrosion of metals ?
- b) Write short notes on (**any two**) : **4**
- i) Humic substances
 - ii) Complexation reaction in water
 - iii) Catalytic converter to control pollution.



3. Attempt **any two** of the following : **10**
- i) Describe monitoring method for Suspended Particulate Matter (SPM)
 - ii) Discuss sampling of water.
 - iii) 'Bhopal Disaster' Explain.
4. a) Describe in brief the segments of the environment. **6**
- OR
- a) Describe 'Thermal pollution'.
- b) Write short note on (**any one**) : **4**
- i) Pollution due to detergents
 - ii) Sources and sinks of SO_x
 - iii) Nonbiodegradable pesticides.
-



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T.Y. B.Sc. (Semester – III) Examination, 2010
ZOOLOGY (Paper – I)
ZO-331 : Animal Systematics and Diversity
2004 Pattern (Old Course)

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*
2) Neat, labelled diagrams must be drawn wherever necessary.
3) Figures to the right indicate full marks.

1. Attempt the following : **10**
- 1) State the function of radula in Pila.
 - 2) State any two important features of Hemichordata.
 - 3) Give one example of Hemichordata.
 - 4) State any two important features of Mammals.
 - 5) State the habitat of Pila.
 - 6) State the organ of equilibrium in Pila.
 - 7) What is the food of Calotes ?
 - 8) What is neoteny ?
 - 9) State the example of mud probing beak.
 - 10) State the function of hyoid apparatus in calotes.
2. Attempt **any two** of the following : **10**
- i) Sketch and label the parts of brain in Calotes.
 - ii) Describe the types of spicules in porifera.
 - iii) Describe the corals in Coelenterata.
3. Write short notes on **any two** of the following : **10**
- a) Aquatic mammals.
 - b) Modification of foot in Mollusca.
 - c) Neoteny in Amphibia.
 - d) General features of Arthropoda.
4. Describe reproductive system of female Pila. **10**
- OR
- Describe reproductive system of female Calotes.
-



[3817] – 728

T.Y. B.Sc. (Semester – III) Examination, 2010
ZOOLOGY (Paper – II) (2004 Pattern)
ZO – 332 : HISTOLOGY OF MAMMALS
(Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Neat labelled diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) Define connective tissue.
 - 2) Mention any one submucosal gland.
 - 3) What is dust cell ?
 - 4) What is sweat gland ?
 - 5) Mention the components of JG complex.
 - 6) Explain structure of filiform papilla.
 - 7) What is holocrine secretion ?
 - 8) What is Kupffer cell ?
 - 9) What is numerical aperture ?
 - 10) What is fixation of tissue ?
2. Attempt **any two** of the following : **10**
- i) Sketch and label V.S. through tooth.
 - ii) Describe histological structure of pancreas.
 - iii) Mention precautions to be taken for paraffin embedding of tissues.

P.T.O.



3. Write notes on **any two** : **10**

- a) L.S. through kidney.
- b) Sketch and label V.S. through skin.
- c) Histological structure of seminiferous tubule.
- d) Histological structure of taste bud.

4. Describe histological structure of stomach. **10**

OR

Describe histological structure of ovary. **10**



[3817] – 735

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOLOGY
GL-333 :Structural Geology
(2004 Pattern) (Old Course) (Paper – III)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Black figures to the right indicate full marks.*
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer/define/explain the following in 2/3 lines :

- a) Give 2 objectives of structural geology. **10**
- b) Enumerate factors governing rock deformation.
- c) Intragranular movements in rocks.
- d) Shear folding.
- e) What are tension fractures ?
- f) Oblique-slip fault.
- g) Slip-cleavages.
- h) Define cleavage bonding.
- i) Fundamental strength of the rocks.
- j) Define “Lithostatic” pressure.

2. Write notes on : (**any two**)

10

- a) Flexure flow folding.
- b) Stages of deformation in rocks.
- c) Anisotropy and inhomogeneity of rocks.

P.T.O.



3. Write notes on (**any two**):

10

- a) Shear folds
- b) Size and shape of salt-domes
- c) Slaty cleavages.

4. What is mechanics of faulting ? Explain briefly with neat diagrams how high angle thrust and low angle gravity faults are produced.

OR

4. Write notes on :

10

- a) Primary and secondary lineations
- b) Fatigue curve.



[3817] – 766

T.Y. B.Sc. (Sem. – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – III)
DS – 333 : Defence Economics
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) State the meaning of Economic system.
 - 2) Write any two indicators of under developed country.
 - 3) What do you mean by security perspectives ?
 - 4) Explain what is defence budget ?
 - 5) What are the merits of war time economy ?
 - 6) Write any two techniques of price control.
 - 7) Define Economic war.
 - 8) Explain what is war mobilization ?
2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Explain need of Financial Management.
 - 2) Discuss process of execution of defence budget in India.
 - 3) Explain Five Year Defence plan and its importance.
3. Write short notes on **(any two)** : **8**
 - 1) Sources of war Finance.
 - 2) Limitations of Economic warfare.
 - 3) Determinants of Defence Expenditure.
4. Answer in **18 to 20** sentences **(any one)** : **8**
 - 1) Explain parliamentary control of defence budget.
 - 2) Discuss techniques of control of rationing with reference to consumption and distribution.

B/II/10/45



[3817] – 767

T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – IV)
DS. No. – 334 : Indian Military History
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Answer in **2 to 4** sentences **each** : **16**
- 1) State any two sources of Indian Military History.
 - 2) What do you mean by Sabha ?
 - 3) Which was the basic weapons during Ramayana Period ?
 - 4) What do you understand by Kshatriya ?
 - 5) What do you know about Chandragupta – I ?
 - 6) Who wrote the well-known book ‘Arthasastra’ ?
 - 7) What do you know about Sudas ?
 - 8) Between whom the “Battle of Tenking” it was fought ?
2. Answer in **8 to 10** sentences **each (any two)** : **8**
- 1) Write in brief about “Vishwamitra”.
 - 2) Explain in short the concept of “Military History”.
 - 3) Write few lines on “Samudragupta”.
3. Write short notes on **(any two)** : **8**
- 1) Weapon system during Mahabharata period.
 - 2) Reason for Battle of Jhelum.
 - 3) Espionage as per Kautilyas interpretation.
4. Answer in **18 to 20** sentences **(any one)** : **8**
- 1) Explain in detail the Battle of Jhelum with the help of battle sketch.
 - 2) Explain the interstate relations as per the Kautilyas perception.



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T.Y.B.Sc. (Sem. – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – VIII)
DS – 338 (A) Armed Forces and Society
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B.: i) *All questions are compulsory.*
ii) *Figures to the right indicate marks.*

1. Answer in **2** or **4** sentences **each** : **16**
- 1) Define 'Army'.
 - 2) Define 'Navy'.
 - 3) Define 'Air Force'.
 - 4) What is 'Society' ?
 - 5) What is 'War' ?
 - 6) What is meant by 'Soldiering' ?
 - 7) What is Culture ?
 - 8) Define 'Profession'.
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Explain the historical view of war and soldiering.
 - 2) Explain the anthropological view of war and soldiering.
 - 3) Explain the political view of war and soldiering.
3. Write short notes on (**any two**) : **8**
- 1) Causes of war.
 - 2) Functional aspect of armed forces.
 - 3) Military as a social institution.
4. Answer in **16** to **20** sentences (**any one**) : **8**
- 1) Explain Moskos analysis on Military profession.
 - 2) Why society could not disassociate itself from the evils of war ? Discuss.

P.T.O.



[3817] – 771

T.Y.B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – VIII)
DS – 338 (B) Geopolitics
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions: i) All questions are compulsory.
ii) Figures to the right indicate full marks.

1. Answer in **2** or **4** sentences **each** : **16**
 - 1) What do you mean by Nation ?
 - 2) Define “Power”.
 - 3) Define “State”.
 - 4) By whom the theory of sea power it was introduced ?
 - 5) Which theory it was introduced by S. B. Cohen ?
 - 6) Write any two factors of geopolitics.
 - 7) Which theory it was introduced by Karl Hanshoffer ?
 - 8) What do you know about Rudolt Kijellen ?

2. Answer in **8** to **10** sentences (**any two**) : **8**
 - 1) Explain in brief policy of the government as a factor of determinant of sea power.
 - 2) Write in brief Karl Hanshoffer as a father of German geopolitick.
 - 3) Explain in brief “Concept of Nation”.

3. Write short notes on (**any two**) : **8**
 - 1) State as a political identity
 - 2) Concept of land power.
 - 3) Territory as a factor of geopolitics.

4. Answer in **18** to **20** sentences (**any one**) : **8**
 - 1) Evaluate the geopolitical thoughts of A. T. Mohan in detail.
 - 2) Critically assess the “Theory of Lebensurum and its utility in a practical manners”.



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T.Y. B.Sc. (Semester – III) Examination 2010
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS – 339(A), Defence Production in India
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B. : 1) All the questions are compulsory.
2) Figures to the right indicate full marks.

1. Answer in **2 to 4** sentences each : **16**
- 1) Where Explosive Research and Development Laboratory (ERDL) is located ?
 - 2) Write the full form of IAT.
 - 3) Write the name of two atomic power stations of India.
 - 4) What do you mean by Industrial Policy resolution ?
 - 5) Explain the meaning of public sector undertaking (PSU).
 - 6) Write any two objectives of DRDO.
 - 7) State the meaning of 'Defence and Development'.
 - 8) What do you mean by 'Budgetary perspective' ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Explain 'Political Economy of Defence Expenditure'.
 - 2) Discuss the concept of Development.
 - 3) What are the problems of collaboration ?
3. Write short notes on (**any two**) : **8**
- 1) Importance of R and D in Defence production.
 - 2) Role of DRDO in India's defence production.
 - 3) Defence industrial base in India.
4. Answer in **16 to 20** sentences (**any one**) : **8**
- 1) Explain industrial policy resolution of the Government of India.
 - 2) Write a critical note on trends in India's defence expenditure.

P.T.O.



[3817] – 772

T.Y. B.Sc. (Semester – III) Examination 2010
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS – 339(B), Defence Management in India
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B. : i) All questions are compulsory.
ii) Figures to the right indicate marks.

1. Answer in **2** or **4** sentences **each** : **16**
 - 1) Define 'Manpower'.
 - 2) Define 'Military Motivation'.
 - 3) What is 'Air Force' ?
 - 4) What is 'Navy' ?
 - 5) What is 'Army' ?
 - 6) Define Non-Military Organisation.
 - 7) Name few functions of Management.
 - 8) What do you mean by HRD ?
2. Answer in **8** to **10** sentences each (**any two**) : **8**
 - 1) Explain the principles of Military Organisation.
 - 2) Discuss applicability of Management to Defence.
 - 3) Explain the organisational aspects of Armed Forces.
3. Write short notes on (**any two**) : **8**
 - 1) Defence Management
 - 2) Decision Making
 - 3) Scope of Management.
4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Discuss the manpower planning and career management in Armed Forces.
 - 2) Discuss defence management at National Level.



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**T.Y. B.Sc. (Semester – III) Environmental Science Examination, 2010
(Old) (2004 Pattern)**

EN-334 : ENVIRONMENTAL MANAGEMENT

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*

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

3) *Figures to the right indicate full marks.*

1. Answer the following in **1-2** lines **each**.

a) Define EIA.

10

b) What are ozone depleting substances ?

c) Mention any two significances of environmental laws.

d) State the importance of environmental audit.

e) Name the international conference held for Green House Gases.

f) What is LCA ?

g) Write any 2 major objectives of RAMSAR Convention.

h) Name the famous person associated with Narmada Aandolan.

i) Define protocol.

j) Mention any two animals under schedule category from Wild Life Act.

2. Write notes on (**any two**) :

10

a) Objectives of EIA.

b) Silent Valley Project.

c) ISO 14000 family.

P.T.O.



3. Attempt **any two** from the following. **10**
- a) Discuss the significance of documentation in ISO system.
 - b) Elaborate on the significance of social component in Environmental impact assessment.
 - c) Discuss the obligations in being party to international conventions.
4. a) Explain the environmental and social concerns of Chipko Movement. **10**
- OR
- b) Discuss the merits and demerits of Environment Protection Act, 1986.



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T.Y. B.Sc. (Semester – III) Examination, 2010
ENVIRONMENTAL SCIENCE
EN-336 : Applied Biology (Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- i) All questions are compulsory.*
 - ii) Draw neat and labelled diagrams wherever necessary.*
 - iii) Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**

- a) Give the scientific name of immobilized yeast used in BOD sensor.
- b) Define prey-predator relationship.
- c) What is phytoremediation ?
- d) Define bioreactor.
- e) Give two names of microbes used in waste water treatment.
- f) Define industrial microbiology.
- g) Define microbial biomass.
- h) Define microbial community profiling.
- i) Give two names of microbes used in alcohol industry.
- j) Mention two basic methods to initiate bioremediation.

2. Attempt **any two** of the following : **10**

- a) Describe role and importance of microbes in the treatment of waste water with suitable examples.
- b) How efficacy of bioremediation is monitored ?
- c) Give a short account on bioreactors used in acid fermentation industry.

P.T.O.



3. Write short notes on **any two** of the following : **10**

- a) Microbial community profiling
- b) Prey-predator relationship
- c) Current status of Biotechnology in environmental protection.

4. Answer **any one** of the following : **10**

- a) What is bioremediation ? Describe constraints and priorities of it with suitable case studies.

OR

- b) What is environmental microbiology ? What is the role of microbes in waste water treatment ? Describe it with suitable examples.



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T.Y. B.Sc. (Semester – III) Examination, 2010
INDUSTRIAL CHEMISTRY – VI (Vocational)
VOC-IND-CH- 336 : Industrial Methods of Chemical Analysis – I
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- N.B. :*
- 1) *All questions are compulsory.*
 - 2) *Figures to the right indicate full marks.*
 - 3) *Neat diagrams must be drawn wherever necessary.*
 - 4) *Use of calculator/Logarithmic table is allowed.*
 - 5) *Assume suitable additional data if necessary.*

1. Answer precisely the following : **10**
- a) Differentiate between gross sample, sample and analysis sample.
 - b) Name different statistical 't' tests.
 - c) State the principle of paper chromatography.
 - d) Define 'retention volume'.
 - e) What is resolution in chromatography ?
 - f) What is the function of guard column in HPLC ?
 - g) Why has a quartz window to be used in uv spectrometry ?
 - h) State the approximate frequency of far IR radiation.
 - i) Define chemical shift.
 - j) Name two solvents used in NMR spectrometry.
2. A) Answer the following (**any two**) : **6**
- a) Describe the techniques of sampling of a gaseous sample.
 - b) Explain the term , 'eddy diffusion'.
 - c) What will be the minimum molar concentration if the molar absorptivity for a complex is $6000 \text{ lit mol}^{-1} \text{ cm}^{-1}$ and the minimum detectable absorbance is 0.02 for a 2.00 cm path length. ?

P.T.O.



B) Answer briefly the following (**any two**) : **4**

- a) Define asymmetric factor and state the causes of its origin.
- b) Explain the term, 'Standard deviation'.
- c) Evaluate the frequency of light having a wavelength 578 nm.
[Velocity of light = 3×10^8 m/s].

3 Answer the following (**any two**) : **10**

- a) Describe the technique of two dimensional paper chromatography and state its advantages.
- b) Explain the working of a Golay cell used as a detector in IR spectroscopy.
- c) The following values were obtained for the nitrite concentration (mg/l) in a sample of river water : 0.403, 0.410, 0.401, 0.411, 0.413, 0.400, 0.380. The last measurement is suspect, should it be rejected ? [Given $Q_{table} = 0.570$]

4. A) What is 'tests of significance' ? Describe briefly various 't' tests.

OR

A) Explain the working of any two detectors used in uv-visible spectroscopy. **6**

B) Solve **any one** of the following : **4**

- a) The retention time of an organic compound on a 100 cm -liquid chromatographic column was 10 min. The width of chromatographic peak was 24 s. Calculate the height equivalent of a theoretical plate for the column.
- b) A grating has 500 lines per mm and width 12 cm. Find the resolving power and the smallest wavelength interval that can be resolved for the blue region of the visible spectrum. ($\lambda = 480$ nm) .



[3817] – 718

T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – IV)
CH-334 : Analytical Chemistry
(2004 – Old Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculators is allowed.*
4) *Neat diagram must be drawn wherever necessary.*

1. Answer the following : **10**
- 1) What is alkaline error in pH-Metry ?
 - 2) Calculate the turbidance if transmittance $T = 0.675$.
 - 3) Give the principle of turbidimetry.
 - 4) Define the term batch extraction.
 - 5) Mention different detectors used in GC.
 - 6) What is difference between GLC and GSC ?
 - 7) Define detection limit in AAS.
 - 8) Mention different types of fuels used in flame photometry.
 - 9) Draw the structure of Ni-DGM complex.
 - 10) Define the term digestion.
2. a) Answer **any two** of the following : **6**
- 1) Explain the role of common ion with suitable examples.
 - 2) Give the limitations of FEs.
 - 3) Explain sample injection system in GC.

P.T.O.



- b) Answer **any two** of the following : **4**
- 1) Distinguish between turbidimetry and calorimetry.
 - 2) Calculate the molar solubility of CaF_2 if solubility product is 4.2×10^{-11} .
 - 3) An organic solid was extracted to the extent of 75% when 40 ml organic phase and 60 ml aqueous phase were shaken together. Calculate the distribution ratio.
3. Attempt **any two** of the following : **10**
- 1) Explain the term coprecipitation and postprecipitation. Give atleast four points of distinguish between them.
 - 2) Discuss in brief applications of AAS.
 - 3) Sketch schematic diagram of the apparatus used for GLC. Describe its components in brief.
4. a) Describe construction and working of calomel electrode. What are its advantages and disadvantages ? **6**
- OR
- a) i) Describe in brief any three applications of FEs. **3**
ii) Describe turbidimetric titrations with suitable examples. **3**
- b) Calculate the amount of solute remaining in aqueous phase after five successive extractions each with 40 ml organic solvent. **4**
Given :
- i) Volume of 3% aqueous solution of organic solute is 100 ml.
 - ii) Distribution ratio $D = 3.0$.
- OR
- b) Calculate the solubility of $\text{Mg}(\text{OH})_2$ in g/liter, if its solubility product is 1.145×10^{-11} at 25°C . **4**
Given : Mol. Wt. of $\text{Mg}(\text{OH})_2 = 58$.



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T.Y. B.Sc. (Semester – IV) Examination, 2010
ELECTRONIC EQUIPMENT AND MAINTENANCE
(Vocational) (Paper – V) (2004 Pattern)
EEM : 345 Entrepreneurship Development

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables, calculators is allowed.*

1. Answer the following : (3×4=12)
- a) Answer the following : (4×1=4)
- i) Define small scale industry.
- ii) Define the term entrepreneur.
- iii) Define the term price.
- iv) Define joint stock company.
- b) Answer the following : (2×2=4)
- i) State and explain any two types of entrepreneur.
- ii) Give two differences between entrepreneur and manager.
- c) Comment on the following : (2×2=4)
- i) Business and profession are different.
- ii) Partnership involves unlimited liability.
2. Answer **any two** of the following : (2×4=8)
- a) Explain the characteristics of an entrepreneur.
- b) Give advantages and limitations of sole trading concern.
- c) Describe the functions involved in human resource management.

P.T.O.



3. Answer **any two** of the following : **(2×4=8)**

- a) Explain objectives and functions of state finance corporation.
- b) Explain how to search for a new business idea.
- c) Describe various aspects of small business management.

4. Answer the following : **(2×6=12)**

- a) Explain the structure of project report for starting a new business.
- b) Explain the term 'marketing mix'.

OR

4. Write short notes on the following : **(3×4=12)**

- a) Cash flow statement.
- b) Types of small scale industries.
- c) Market segmentation.



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T.Y. B.Sc. (Semester – III) Examination, 2010
MATHEMATICS (Paper – VII) (MT-337)
MT-337 (A) Operations Research – I
MT-337 (B) Graph Theory
MT-337 (C) Computational Mathematics – I
MT-337 (D) Combinatorics
(2004 Pattern) (Old Course)

Time: 2 Hours

Max. Marks: 40

- Note :* 1) Candidates are advised to see the **relevant question paper** and solve the **same**.
- 2) *Use of logarithmic tables and calculators is allowed.*
- 3) *All questions are compulsory.*
- 4) *Graph paper will be supplied on demand.*
- 5) *Figures to the right indicate full marks.*

A) Operations Research – I

I. Attempt **each** of the following :

10

- i) Define a standard form of L.P.P.
- ii) What is the difference between slack and surplus variables ?
- iii) When do we use artificial variables in simplex method ?
- iv) Write any one application of operations research.
- v) What is an unbalanced transportation problem ?
- vi) Which method is better to find an initial basic feasible solution for a transportation problem ?
- vii) What is an assignment problem ?

P.T.O.



viii) Write the dual of the following L.P.P.

$$\text{Maximize } Z = 4x_1 - 2x_2$$

$$\text{Subject to } x_1 + 5x_2 = 6$$

$$2x_1 - 3x_2 \leq 3$$

$$x_1 \geq 0, x_2 \geq 0$$

ix) What is meant by a feasible region ?

x) What do you mean by degeneracy in a transportation problem ?

2. Attempt **any two** of the following :

10

i) Wild West produces two type of Cowboy hats. Type 1 hat requires twice as much labour time as does each of type 2. If all produced hats are of type 2 only, the company can produce a total of 400 hats a day. The market daily limits are 150 and 200 hats for type 1 and 2 respectively. The profit per type 1 hat is Rs. 8 and that of type 2 hat is Rs. 5. Formulate the problem as a linear programming so as to maximize the profit.

ii) Determine all the basic solutions to the following system of linear equations.

$$x_1 + 2x_2 + x_4 = 4$$

$$2x_1 + x_2 + 5x_3 = 5$$

iii) Solve the following linear programming problem by simplex method.

$$\text{Max } Z = 6x_1 + 4x_2$$

Subject to

$$-2x_1 + x_2 \leq 2$$

$$x_1 - x_2 \leq 2$$

$$3x_1 + 2x_2 \leq 9$$

$$x_1 \geq 0, x_2 \geq 0.$$



3. Attempt **any two** of the following :

10

i) Solve the following assignment problem.

		Operator				
		I	II	III	IV	V
Machines	A	10	5	13	15	16
	B	3	9	18	3	6
	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

ii) Find the initial basic feasible solution by VAM.

To

	D₁	D₂	D₃	D₄	Supply
O₁	3	4	6	3	30
From O₂	3	5	7	10	50
O₃	2	6	5	7	70
Demand	22	44	41	43	

iii) Write the following assignment problem as a linear programming problem.

		Job			
Worker	A	B	C	D	
1	45	40	51	67	
2	57	42	63	55	
3	49	52	48	64	
4	41	45	60	55	



4. Attempt **any one** of the following :

10

i) Use Big-M method to solve the following linear programming problem.

$$\text{Maximize } Z = -2x_1 - x_2$$

Subject to

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$x_1 \geq 0, x_2 \geq 0.$$

ii) Find optimum solution of the following transportation problem :

Destination

		D₁	D₂	D₃	D₄	Supply
Origin	O₁	19	30	50	10	7
	O₂	70	30	40	60	9
	O₃	40	8	70	20	18
Demand		5	8	7	14	



MATHEMATICS (Paper – VII) (MT-337)
MT-337 (B) Graph Theory
(2004 Pattern) (Old Course)

Time: 2 Hours

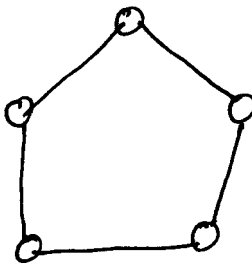
Max. Marks: 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

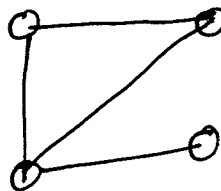
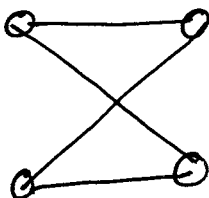
I. Attempt **each** of the following :

10

- i) Draw a graph which is Hamiltonian but not Eulerian.
- ii) State whether the following statement is true or false with justification.
There exists a circuitless graph containing exactly one pendant vertex.
- iii) Define a directed graph.
- iv) Determine whether the following graph is self complementary.



- v) Define edge connectivity of a graph.
- vi) Are the following graphs isomorphic ? Justify.



- vii) Define an arborescence.
- viii) Show that there does not exist a regular graph of degree 3 on 9 vertices.



ix) Find the graph represented by the adjacency matrix.

$$\begin{bmatrix} 0 & 1 & 2 & 2 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 2 & 1 & 0 & 1 & 1 \\ 2 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 2 \end{bmatrix}$$

x) Draw all non-isomorphic trees with 3 vertices.

2. Attempt **any two** of the following :

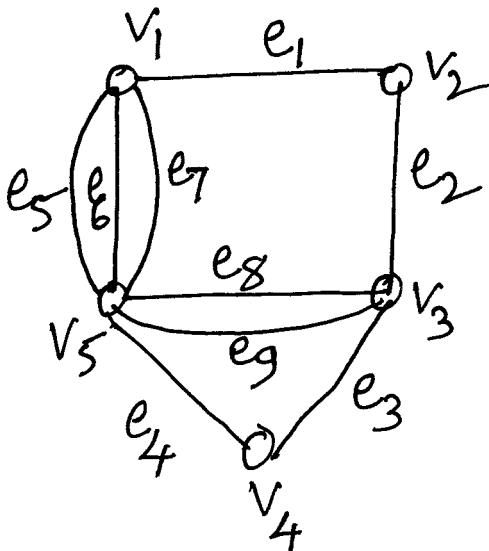
10

i) If G is a simple graph with n vertices and k components, then prove that G

has atmost $\frac{(n - k)(n - k + 1)}{2}$ edges.

ii) Prove that every tree has either one or two centres.

iii) Find the incidence and the adjacency matrix of the graph G given below.

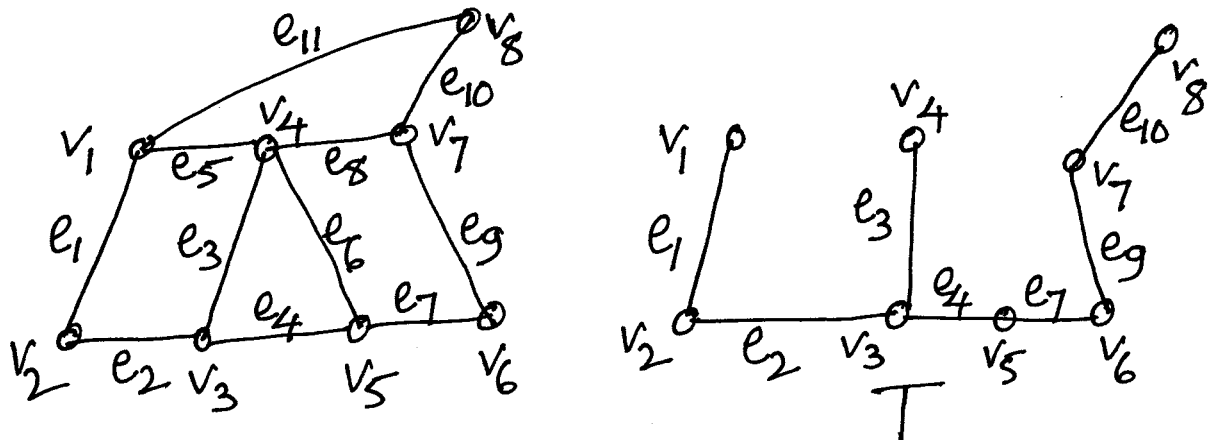




3. Attempt **any two** of the following :

10

- i) Prove that a connected graph G is an Euler graph if and only if it can be decomposed into edge disjoint circuits.
- ii) Prove that the ring sum of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets.
- iii) List all fundamental cut-sets of the following connected graph with respect to the given spanning tree. T .



4. Attempt **any one** of the following :

10

- i) a) If G is a simple connected graph, then prove that the vertex connectivity of G cannot exceed the edge connectivity of G .
- b) Find the maximum edge connectivity of a graph with 8 vertices and 16 edges. Draw a graph showing that this can be achieved.
- ii) a) Prove that in the vector space of a graph, the circuit subspace and the cutset subspace are orthogonal to each other.
- b) Draw the arborescence and express in Polish notation the expression $(3x + y)(6a - 3b)^4$.



MATHEMATICS (Paper – VII) (MT-337)
MT-337 (C) Computational Mathematics – I
(2004 Pattern) (Old Course)

Time: 2 Hours

Max. Marks: 40

*N.B.: i) All questions are compulsory.
ii) Figures to the **right** indicate **full** marks.*

I. Attempt **each** of the following : **10**

i) Which of the following are valid constants ? Justify.

a) 10.1 b) 10,000

ii) Which of the following declarations are valid ? Justify.

a) float mr X b) int 1 first

iii) Find the value of the expression :

$3 * 4 * 2 \% 3 + 4$

iv) Write an algorithm to find the sum of two numbers.

v) Write a program to find the maximum of two numbers.

vi) Draw a flow chart to check whether the number is odd or even.

vii) Write a function to calculate factorial of n.

viii) Explain the meaning of the following declaration :

int x[20], y;

ix) What is the difference between '\0', and '0'.

x) Find the correct syntactic translation in 'c' of $\frac{ax^2 + bx + c}{c(dx + e)}$.

2. Attempt **any two** of the following : **10**

i) Write a short note on switch statement.

ii) Write a short note on 1-dimensional arrays.

iii) Write a program to find the sum of digits of a positive integer.



3. Attempt **any two** of the following : **10**

- i) Write a short note on while loop. Also give an example of a while loop.
- ii) Write an algorithm to check whether the given number is a prime or a composite.
- iii) Draw a flow chart to find the average of n numbers.

4. Attempt **any one** of the following : **10**

- i) a) Write a short note on functions in C.
- b) Write the output of the following program

```
main ( )
{
    int i, j, k = 4;
    for (i = 0; i < k; i++)
    {
        print f(“%d \n”, i);
        (j = i; j < k; j++)
        print f (“%d”, j);
        k- -;
    }
}
```

- ii) a) Write a short note on if-else statement and the conditional operator.
 - b) Write a C program to find sin x using Taylor’s series expansion, correct upto 5 decimal places.
-



MATHEMATICS (Paper – VII) (MT-337)
MT-337 (D) Combinatorics
(2004 Pattern) (Old Course)

Time: 2 Hours

Max. Marks: 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Attempt **each** of the following : **10**

i) Determine the number of arrangements of the seven letters of the word ‘SYSTEMS’.

ii) There are six different French books, seven different German books and four different English books. How many ways are there to pick 3 books, one of each language ?

iii) Find the number of ternary sequences of length 10.

iv) Find the roots of the characteristic equation associated with the recurrence relation.

$$a_{n+2} - 5a_{n+1} + 6a_n = 0, \text{ for } n > 0.$$

v) How many non-negative integer solutions does $x_1 + x_2 + x_3 + x_4 = 27$ have ?

vi) Let $n \geq 2$. How many onto functions are there from $\{1, 2, \dots, n\}$ to $\{1, 2\}$?

vii) How many numbers between 1 and 30 are relatively prime to 30 ?

viii) How many ways are there to distribute 40 identical jelly beans among 4 children without restrictions ?

ix) Prove that $\binom{n}{1} + 6\binom{n}{2} + 6\binom{n}{3} = n^3$.

x) State the addition and multiplication principle.



2. Attempt **any two** of the following : 10

i) Show by a combinatorial argument that

$$\binom{n}{0} + \binom{n}{1} + \dots + \binom{n}{n} = 2^n.$$

ii) Find the coefficient of x^{17} in the expansion of $(x^3 + x^4 + x^5 + \dots)^3$.

iii) How many ways are there to pick 2 successive cards from a standard 52 card deck such that the first card is a Spade and the second card is not a Queen.

3. Attempt **any two** of the following : 10

i) Solve $a_n = 4a_{n-1} - 4a_{n-2}$; $n \geq 3$, $a_1 = 1$, $a_2 = 7$.

ii) Show that at a party of 20 people, there are 2 people, who have the same number of friends.

iii) Suppose there are 100 students in a school and there are 40 students taking each language French, Latin and German. 20 students are taking only French, 20 are taking only Latin and 15 taking only German. In addition 10 students are taking French and Latin. How many students are taking no language ?

4. Attempt **any one** of the following : 10

i) a) Find a recurrence relation for the number of ways to distribute n distinct objects into five boxes. What is the initial condition ?

b) How many 10-letter sequences are there using 5 different vowels and 5 different consonants (chosen from the 21 possible consonants) ? What is the probability that one of these words has no consecutive pair of consonants ?

ii) a) State and prove the principle of Inclusion and Exclusion for 3 sets.

b) Build a generating function for a_r , the number of r selections from a pile of :

(α) Three red, four black and four white balls.

(β) Five jelly beans, three licorice sticks, eight lollipops with atleast one of each candy.

(γ) Unlimited amounts of pennies, nickels, dimes and quarters.

(δ) Seven types of lightbulbs with an odd number of the first type and an even number of the second type.



[3817] – 741

T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal) (Paper – III)
ST 333 : Statistical Process Control
(Online Methods) (2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of scientific calculator and statistical table is allowed.*
4) *Symbols and abbreviations have usual meaning.*

1. Attempt **each** of the following :

a) Choose the correct alternative in **each** of the following : **(1 each)**

i) Spread of a process is given by

- A) σ B) μ C) 6μ D) 6σ

ii) The following limits are decided by engineer and not by statistician

- A) Specification limits B) 3 sigma limits
C) Probability limits D) K sigma limits

iii) The following is not a 7 PC tool

- A) Control chart
B) Pareto diagram
C) Operating characteristic curve
D) Cause and effect diagram

iv) When process standard deviation σ is specified, the 3σ control limits for R chart are

- A) $(D_2 \bar{R}, D_1 \bar{R})$ B) $(D_1 \sigma, D_2 \sigma)$
C) $(D_3 \sigma, D_4 \sigma)$ D) $(d_2 \bar{R}, d_2 \sigma)$

b) State whether each of the following statements is **true** or **false** : **(1 each)**

- i) When process standard deviation σ is not known, it is estimated by $\sum_i R_i$.
ii) The LCL and UCL of a p chart using stabilized control limits are -3 and 3 .

P.T.O.



- c) Distinguish between :
- i) chance causes and assignable causes of variation. 1
 - ii) a defect and a defective. 1
- d) i) State any two criteria for lack of statistical control on a variable control chart. 1
- ii) Interpret $C_{pk} = 1.33$. 1

2. Attempt **any two** of the following : (5 each)

- a) Explain the method of construction of \bar{X} chart when the standards are not known. If all the points occur within control limits in a random manner what conclusion you will state ?
- b) Explain the construction of Pareto diagram and interpretation of it.
- c) After 40 subgroups of size 4 each it was observed that $\bar{\bar{X}} = 200$ cm and $\bar{R} = 12.354$ cm. The specification limits are 190 cm and 218 cm. Check whether the process meets the specifications. If not, estimate the percent defectives.

3. Attempt **any two** of the following : (5 each)

- a) Explain in detail the construction and interpretation of C chart when standard is not given.
- b) Define C_p and C_{pk} for a stable process. Interpret $C_p = C_{pk}$.
- c) A process is being controlled w.r.t. a fraction defectives chart. The procedure consists of taking hourly samples of 400 items. The 3σ control limits are obtained as $LCL = 0.02175$ and $UCL = 0.09825$. If the process average f.d. shifts to 0.10, calculate the probability that this shift is detected on
 - i) first sample after the shift
 - ii) second sample after the shift.



4. Attempt **any one** of the following :

- a) i) Explain the construction of p chart using separate control limits when subgroups sizes n_i are different and the standard is not given. **6**
- ii) Write notes on decisions preparatory to control charts w.r.t.
- I) size of subgroups
 - II) frequency of subgroups. **4**
- b) i) Write short notes on :
- I) Uses of SPC
 - II) Moving range chart. **6**
- ii) Distinguish between control charts for variables and control charts for attributes. **4**
-



[3817] – 743

T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal) (Paper – V)
ST-335 : ‘C’ Programming (Turbo ‘C’)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:* i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Use of scientific calculators and statistical tables is allowed.**
iv) **Symbols and abbreviations have their usual meanings.**

1. Attempt each of the following :

a) In each of the following cases, choose the correct alternative. **(1 each)**

i) Which of the following is not a logical operator ?

- A) & B) & & C) || D) !

ii) The value of an integer variable a in $a = 45/10$ is

- A) 1 B) 4 C) 4.5 D) 5

iii) By the declaration `int b[3][3]` the number of array elements in array b is equal to

- A) 6 B) 12 C) 9 D) 10

iv) Consider the following statements :

```
int m, n;
```

```
m = 10;
```

```
n = m++;
```

The values assigned to m and n are

- A) m = 10, n = 11
B) m = 11, n = 10
C) m = 11, n = 11
D) m = 10, n = 10

P.T.O.



- b) In each of the following cases, state whether the given statement is **true** or **false**. **(1 each)**
- i) For $x = 11$, $y = 6$ the value of the expression $x > 9 \ \&\& \ y \neq 3$ is 0.
 - ii) While loop is executed at least once without checking the condition.

- c) i) Write an expression in C for each of the following mathematical expressions. **1**

a) $ut + \frac{1}{2}at^2$

b) $x^2 + \frac{3}{2}xy + 4$

- ii) Explain the use of `getchar()` function with suitable example. **1**
- iii) State the difference between declaration of a variable and definition of a symbolic name. Illustrate with an example. **1**

- iv) A C program contains the following variable declarations :

`int a = 3463;`

`float x = 34.6389;`

What will be the output of the following statement ?

`printf (“% 6d \n % 7.3f”, a, x);` **1**

2. Attempt **any two** of the following : **(5 each)**

- a) Write a C program to obtain the sum of digits of a number.
- b) Explain each of the following with a suitable example along with syntax and usage.
 - i) `if else`
 - ii) `do while`
- c) Write a C program to arrange 10 numbers in ascending order.



3. Attempt **any two** of the following : **(5 each)**
- a) Write a function to find factorial of a positive number k and use it to find the value of $\binom{n}{r}$.
 - b) Define a pointer in C. How is it declared and initialized ? Write a C program to read an array of integers and print its elements.
 - c) Write a C program to find addition of two matrices each of order 3×3.
4. Attempt **any one** of the following :
- a) i) Write a C program to accept a string through keyboard and print number of E's occurring in it. **5**
 - ii) Write a C program that will read the value of x and evaluate the following function.
$$y = x^2 + 5 \quad \text{for } x > 0$$
$$= 5 \quad \text{for } x = 0$$
$$= -(x^2 + 5) \text{ for } x < 0$$
 5
 - b) i) Draw a flow chart to obtain and print maximum of three given numbers. **4**
 - ii) Write a C program that will compute and print coefficient of variation of 10 given numbers. **6**
-



[3817] – 755

T.Y. B.Sc. (Semester – III) Examination, 2010
MICROBIOLOGY (Paper – IV) (Old)
M.B-334 : Immunology
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Answer the following : **10**

a) Define :

- i) Passive immunity
- ii) Interferon.

b) State **True/False** :

- i) Macrophages are antigen presenting cells.
- ii) Lymphocytes become immunocompetent in secondary lymphoid organs.
- iii) Heptanes are immunogens.

c) Match the following :

- | | |
|------------------------------|---------------------------|
| i) Fc receptor | a) Totipotent |
| ii) INF- α | b) Pregnancy test |
| iii) Factor-B | c) Eosinophils |
| iv) Agglutination inhibition | d) Alternate pathway |
| v) Stem cells | e) Inflammatory mediators |

2. Write short notes on (**any two**) : **10**

- a) Widal Test
- b) IgM
- c) Natural killer cells.

P.T.O.



3. Attempt **any two** of the following : **10**

- a) Diagrammatically explain structure of spleen.
- b) Explain classical pathway of complement activation.
- c) Describe properties and functions of interferons.

4. Attempt **any one** of the following : **10**

- a) Explain precipitation reactions in fluid with the help of principle; procedures and applications.
 - b) Describe structure of IgG.
-



[3817] – 763

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI A)
EL – 336 (A) : Computer Hardware – II
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are **compulsory**.*
*2) Draw **neat** diagrams **whatever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

1. Attempt **all** of the following :

- | | |
|--|---|
| a) What is CISC ? | 1 |
| b) Write the function of firewall. | 1 |
| c) What is the form factor of mother board ? | 1 |
| d) List any two software tools used for troubleshooting. | 2 |
| e) What is the function of logic probe ? | 1 |
| f) List any two advantages of SMPs. | 2 |
| g) Write any two advantages of GUI over CUI. | 2 |
| h) Write the advantages of DRAM over SRAM. | 2 |

2. Attempt **any two** of the following :

- | | |
|---|---|
| a) List different video standards used for PC. Write technical specifications of any two. | 4 |
| b) Describe the features of pentium machine. | 4 |
| c) Describe working principle of any one impact printer. | 4 |

P.T.O.



3. Attempt **any two** of the following :

- a) What is computer virus ? Which preventive maintenance measures are to be taken to avoid virus problem. **4**
- b) Explain RAM and ROM in short. **4**
- c) Write the difference between ON-line and OFF-line UPs. **4**

4. Attempt **any two** of the following :

- a) Draw the functional block diagram of motherboard and explain it in brief. **6**
 - b) Explain how you will do preventive maintenance of PC from dust, heat and humidity. **6**
 - c) Write any six functions of operating systems in detail. **6**
-



T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI B)
EL – 336 (B) : Computer Network Design and Maintenance – II
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are **compulsory**.
2) Figures to the **right** indicates **full** marks.
3) Draw **neat** diagrams **wherever** necessary.*

1. Attempt **all** of the following :

- a) Mention the encoding scheme used at physical layer of OSI-ISO. **1**
- b) What is cross talk in network ? **1**
- c) Write the features of CAT3 cable. **1**
- d) What is Protocol ? **1**
- e) Mention the distance upto what 10 BASE 5 can be used. **1**
- f) List the advantages of co-axial cable over STP. **2**
- g) “Repeat is essential port of network” – Comment. **2**
- h) What is an intranet ? **1**
- i) List the types of losses occur in long transmission line. **2**

2. Attempt **any two** of the following :

- a) Write the difference between bus and star topologies. **4**
- b) List the various power protection devices. Explain any one of them. **4**
- c) Write note on IPX/SPX routing. **4**



3. Attempt **any two** of the following :

- a) Describe the working of repeater. **4**
- b) Write the advantages and disadvantages of STP cable. **4**
- c) Giving classification of HUB, explain any one of them in short. **4**

4. Attempt **any two** of the following :

- a) Write the advantages of networking the networks. Describe any two layers of ISO-OSI reference model. **6**
 - b) Explain the basics of MAN and WAN. **6**
 - c) Write short note on : **6**
 - i) Data network
 - ii) Network management protocol.
-



T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI C)
EL – 336 (C) : Biomedical Instrumentation – II
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

Note : i) All questions are compulsory.
ii) Draw neat diagrams wherever necessary.
iii) Figures to the right indicate full marks.

1. Answer **all** of the following :

- a) What is Biomedical Instrument ? 1
- b) List at least four sensors used for temperature measurement. 1
- c) What is EMG ? 1
- d) What is meant by non-polarizable electrode ? 1
- e) Optical filters are not useful in optical instrument. Justify the statement. 2
- f) For measurement of biopotential, electrodes are required. Comment. 2
- g) State different indicator dilution methods. 2
- h) What are different methods of blood pressure measurement ? 2

2. Answer **any two** of the following :

- a) Explain in brief radiation sensor and radiation source. 4
- b) What is body surface electrode ? State different types of them with appropriate applications ? 4
- c) Draw block diagram of cardiac monitor. Explain its working in brief. 4



3. Attempt **any two** of the following :

- a) Draw block diagram of Biomedical instrumentation system. Explain the function of each block. **4**
- b) Discuss the effect of kinetic energy in blood pressure measurement. **4**
- c) Explain with suitable diagram the ultrasonic flow meter. **4**

4. Attempt **any two** of the following :

a) Define the following terms :

- i) Accuracy
 - ii) Sensitivity
 - iii) Range
 - iv) Nonlinearity. **6**
- b) Explain biotelemetry in brief. **6**
 - c) Sketch the block diagram of ECG and explain the function of each block. **6**
-



T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI D)
EL – 336 (D) : Electronic Instrumentation – II
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are compulsory.*
2) Draw neat diagrams wherever necessary.
3) Figures to the right indicate full marks.

1. Attempt **all** of the following :

- a) Define accuracy. 1
- b) State any two types of standards. 1
- c) What are different types of digital recorder ? 1
- d) What is unit of sound level ? 1
- e) If voltage gain is 20, what gain in dB ? 2
- f) Comment – Instrument needs to be calibrated. 2
- g) LDR is active transducer – Comment. 2
- h) What are important steps in signal conditioning. 2

2. Attempt **any two** of the following :

- a) State the different methods of flow measurement. Explain any one. 4
- b) Name different indicating type instruments and compare them in brief. 4
- c) Explain with diagram, working of sound pressure level meter. 4



3. Attempt **any two** of the following :

- a) Explain working of DVM with neat block diagram. **4**
- b) Explain 'Electrical Amplifying Elements'. **4**
- c) Describe the working of dual slope ADC. **4**

4. Attempt **any two** of the following :

- a) Write short note on Electromechanical Transducers. **6**
 - b) What are different types of dynamometer ? Explain any one. **6**
 - c) List various types of recording Instruments. Explain any one. **6**
-



T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI E)
EL – 336 (E) : Agri-Electronics – II
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :1) All questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*
*3) Diagrams must be drawn **wherever** necessary.*

1. Attempt **all** of the following :

- a) What is the working principle of critical angle refractometer ? 1
- b) List various leaf parameters. 1
- c) Which kind of actuator will be needed in automated Irrigation system ? 1
- d) Define Microclimate measurements. 1
- e) State importance of indigenous design and development in agrielectronics. 2
- f) What is reverse osmosis ? State its application. 2
- g) What is soil thermometer ? Why it is needed ? 2
- h) State advantages and limitations of programmable drip irrigation system. 2

2. Attempt **any two** of the following :

- a) What is need and scope of electronics in agriculture ? Elaborate with one example. 4
- b) State various parameters used for soil analysis. Discuss any one of them in detail. 4
- c) Explain with diagram carbon balance cycle in environment. 4



3. Attempt **any two** of the following :

- a) What are water management techniques ? Explain how autodripirrigation system plays important role in it. **4**
- b) Suggest a temperature controller circuit to be installed in a green house. **4**
- c) Write short note on soil thermometer. **4**

4. Attempt **any two** of the following :

- a) List various agrometeorological parameters. How they are measured ? Discuss any one in detail. **6**
 - b) Discuss designing of automatic drip irrigation system in one acre of agricultural field. Give appropriate justifications. **6**
 - c) What is evapotranspiration ? How it is measured ? Discuss its importance in agriculture. **6**
-



T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – VI F)
EL – 336 (F) : Fiber Optics and Fiber Optic Communication – II
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are **compulsory**.
2) Figures to the **right** indicates **full** marks.
3) Draw labelled diagrams **wherever** necessary.*

1. Attempt **all** of the following :

- a) Define critical angle. 1
- b) What is Numerical Aperture of optical fiber. 1
- c) List the requirements of optical detector. 1
- d) Define quantum efficiency of photodetector. 1
- e) What is linear scattering in optical fiber. 2
- f) “Single mode fibers are dominant and most widely used”. Comment. 2
- g) List drawbacks of LED sources in comparison with injection laser. 2
- h) Define Responsivity of photodiode. Write its expression. 2

2. Attempt **any two** of the following :

- a) What is graded index fiber ? Explain its possible fiber refractive index profile. 4
- b) What is linear scattering? Explain Rayleigh scattering in brief. 4
- c) List different LED structures available. Explain any one in brief. 4



3. Attempt **any two** of the following :

- a) Define the terms acceptance angle and total internal reflection. **4**
- b) Why there is relatively low inter modal dispersion in multimode graded index fiber. **4**
- c) Explain ideal and practical LED characteristics. **4**

4. Attempt **any two** of the following :

- a) Write the principle on which optical detector works. List the requirements of optical detector. **6**
- b) What is star coupler and three port coupler ? **6**
- c) i) Differentiate between spontaneous and stimulated emission. **3**
ii) What is population inversion ? Explain with proper diagram. **3**



[3817] – 764

T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – I)
DS-331 : Role of Science and Technology in National Security
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences : **16**
 - 1) Define National Security.
 - 2) What is systematic observation ?
 - 3) What do you mean by 'Invention' ?
 - 4) What is conventional energy ?
 - 5) What is non-conventional energy ?
 - 6) Define 'Scientific Law'.
 - 7) When 'gunpowder' was developed ?
 - 8) Introduce 'Nuclear Age'.

2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Explain the distribution system of energy.
 - 2) Explain how science has contributed to Military Technology ?
 - 3) Write the uses of science in Middle age.

3. Write short notes on **(any two)** : **8**
 - 1) Principles of conservation of energy.
 - 2) Industrial Revolution.
 - 3) Era of Experiment.

4. Answer in **16 to 20** sentences **(any one)** : **8**
 - 1) Explain the various application of energy.
 - 2) Explain how Science and Technology has contributed to Industrial Development.



[3817] – 782

T.Y. B.Sc. (Semester – III) (Voc.) Examination, 2010
ELECTRONIC EQUIPMENT MAINTENANCE
(Vocational) (Paper – V)
EEM-335 : Troubleshooting and Repairs
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log-tables, calculator is allowed.*

1. Answer the following : (3×4=12)
- a) Answer the following : (4×1=4)
- i) What makes replacement of an IC difficult ?
 - ii) State advantages of SMPS over linear regulator.
 - iii) What can be likely fault if closed-loop gain of an op-amp circuit is low ?
 - iv) What are cross-point faults in digital circuits ?
- b) Answer the following : (2×2=4)
- i) How many checks are required to locate faulty stage in a 7 stage linear system using split-half method ?
 - ii) In a zener regulator $V_{in} = 16 \text{ V}$, series resistor $R_s = 2 \text{ k}\Omega$, $V_z = 10 \text{ V}$ and $R_L = 8 \text{ k}\Omega$. Find the voltage across R_L when zener diode is open and when zener diode is short.
- c) Comment on the following : (2×2=4)
- i) Specification checking of electronic instrument is necessary after it is repaired.
 - ii) Fuse is called fail-safe device.

P.T.O.



2. Answer **any two** of the following : (2×4=8)
- a) Explain identification of faulty stage during troubleshooting of electronic systems with – Linear stages – Divergent circuits.
 - b) Discuss typical faults in resistors.
 - c) Explain open-circuit and short-circuit faults in a transistor.
3. Answer **any two** of the following : (2×4=8)
- a) Explain fault model of digital circuits.
 - b) Outline troubleshooting procedure for power supply units.
 - c) Explain typical faults in digital multimeter.
4. Answer the following : (2×6=12)
- a) Explain the following :
 - Testing a power supply for line and load regulation.
 - Testing an inductor.
 - b) Explain the following faults and their remedies in a CRO.
 - No spot – H-deflection in adequate – poor vertical sensitivity – waveform not stable.

OR

4. Answer the following : (3×4=12)
- a) In a non-inverting amplifier $R_f = 18 \text{ k}\Omega$ and $R_1 = 2 \text{ k}\Omega$. If input is 0.2 V dc, what will be the output voltage ? Find output voltage if i) R_f is open and ii) R_f is short circuit.
 - b) Use the truth table method to find test vectors for different faults in an AND gate with 3 inputs (lines 1, 2 and 3 are inputs and line 4 is output).
 - c) i) Calculate primary to secondary turns ratio for a transformer if 8 Ω load in secondary is to be matched to an impedance of 800 Ω in primary circuit.
ii) Calculate % load regulation for a regulated power supply if $V_{NL} = 10 \text{ V}$ and $V_{FL} = 9.9 \text{ volt}$.



[3817] – 787

T.Y. B.Sc. (Semester – III) Examination, 2010
(Vocational)
BIOTECHNOLOGY – VI
BT-336 : Environmental Biotechnology and Entrepreneurship
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) Answer *all* 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. Answer the following : 5
- a) Define MLVSS.
 - b) What is green house effect ?
 - c) What is zooglyphic film ?
 - d) What is food infection ?
 - e) Define biomagnification.
2. Attempt **any one** of the following : 5
- a) Comment on conventional energy sources and global warming.
 - b) Explain the role of GEMS in hazardous waste treatment.
3. Discuss in brief **any one** of the following : 5
- a) Mode of action of B.T. toxin.
 - b) Lignocellulose as major source of energy.

P.T.O.



4. Write notes on **any one** of the following : 5
- a) Presumptive test for water analysis.
 - b) LAL test for food analysis.

SECTION – II

1. Answer the following in **one** or **two** lines : 5
- a) What is the need of Entrepreneur ?
 - b) Give the full form of SICOM.
 - c) What is SWOT ?
 - d) State one responsibility of entrepreneur.
 - e) Define communication.
2. Answer **any one** of the following in **10** to **12** lines : 5
- a) What are the functions of an entrepreneur ? Explain in detail.
 - b) How should a business product report be structured ? Write with special reference to technical and economic feasibility of the project.
3. Write notes on **any one** of the following : 5
- a) Scope of a co-operative organization.
 - b) “Business ethics”.
4. What are the market survey techniques ? Explain with suitable example. 5

OR

What are the characteristics of a sole trading firm ?



[3817] – 791

T.Y. B.Sc. (Semester – III) Examination, 2010
COMPUTER MAINTENANCE – VI (Vocational)
Computer Network Design and Maintenance
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

1. Answer the following in **one/two** sentences. **(1×10=10)**

- a) What is a network ?
- b) List any two protocols used in network.
- c) Classify Topology.
- d) List the type of cable used in Telephone network.
- e) What is EMI ?
- f) What is BALUN ?
- g) State any one energy loss in long wire.
- h) Which is communication method used for video network ?
- i) State any two signalling methods used in network.
- j) List any two network expansion devices.

2. Solve **any two** : **(5×2=10)**

- a) State the classification of cables and explain any one.
- b) What are the different types of Ethernet ? Explain any one.
- c) Explain the power estimation method.

P.T.O.

[3817] – 791



3. Solve **any two** :

(5×2=10)

- a) State different power protection devices. Explain any one.
- b) Write short notes on HUB, Bridge.
- c) Explain spanning tree algorithm.

4. Solve **any one** :

(10×1=10)

- a) State different OSI layers. Explain any two layers of it.
 - b) Classify the network category. Explain any two in detail.
-



[3817] – 705

T.Y. B.Sc. (Sem. – III) Examination, 2010
MATHEMATICS (Paper – V)
MT-335 : Dynamics (2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

N.B.: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Attempt **each** of the following : **10**
- i) The co-ordinates of a moving particle at time t are given by $x = a(t + \sin 2t)$,
 $y = a(1 - \cos 2t)$. Show that its acceleration is of constant magnitude.
 - ii) State Newton's second law of motion.
 - iii) What is the least velocity of projection to hit a target at a point (h, k) ?
 - iv) Define horizontal range of a projectile.
 - v) If the maximum horizontal range of a particle in a projectile motion is R , show
that the greatest height attained is $\frac{1}{4} R$.
 - vi) The pedal equation of a parabola is $p^2 = ar$ where focus is the pole. Find the
law of force.
 - vii) A force $5\mathbf{i} + 10\mathbf{j} + 3\mathbf{k}$ acts on a particle causing the displacement $4\mathbf{i} - \mathbf{j} + 3\mathbf{k}$.
Find the work done.
 - viii) State work energy principle.
 - ix) State Kepler's first law of planetary motion.
 - x) Let m_1 and m_2 be the masses of two particles attached to the two ends of a
string which passes over a fixed smooth pulley. Write the expression for
acceleration.

P.T.O.



2. Attempt **any two** of the following :

10

- i) A particle moves in a straight line with constant acceleration f . Derive the following equations of motions.

$$v = u + ft$$

$$x = ut + \frac{1}{2}ft^2$$

$$v^2 = u^2 + 2fx.$$

- ii) The pilot of an aeroplane which flies at a speed of 400 km/hr. wishes to fly from Delhi to Chandigarh due 250 kms north of Delhi. There is a 50 km/hr wind from the west.

- a) What direction should the plane take ?
- b) What time will it take to make the trip ?

- iii) A particle just clears a wall of height b at a distance a and strikes the ground at a distance c from the point of projection. Prove that the angle of projection is

$$\tan^{-1} \left[\frac{bc}{a(c-a)} \right].$$

3. Attempt **any two** of the following :

10

- i) For a particle describing a central orbit, derive the equation $F = h^2u^2 \left[u + \frac{d^2u}{d\theta^2} \right]$

$$\text{where } u = \frac{1}{r}.$$

- ii) A particle of mass m is projected in the vertical plane with velocity u at an angle α to the horizontal under the action of gravity. Find the equation of trajectory.

- iii) Show that the curve $r^3 = a^3 \cos 3\theta$ can be described under a force to the pole varying inversely as r^9 .



4. Attempt **any one** of the following :

10

i) a) Derive Kepler's second law of planetary motion.

b) At the end of three successive seconds the distance of a point moving with S.H.M. from its mean position measured in the same direction are 1, 5 and 5.

Show that the period of complete oscillation is $\frac{2\pi}{\theta}$, where $\cos\theta = \frac{3}{5}$.

ii) a) The sum of two weights of an Atwood's machine is 16 kg. The heavier weight descend 24.5 meters in 4 seconds. What is each weight.

b) A road and a railway line cross at right angles. If at a certain instant, a car is approaching the crossing at 15 m/sec. and the train at 20 m/sec. Find the magnitude and direction of the velocity of the train, relative to the car at that instant.



[3817] – 715

T.Y. B.Sc. (Semester – III) Examination, 2010
(2004 Pattern/Old Course)
CHEMISTRY (Paper – I)
CH - 331 : Physical Chemistry

Time : 2 Hours

Max. Marks : 40

- N.B. :**
- 1) *All questions are compulsory.*
 - 2) *Figures to **right** indicate **full** marks.*
 - 3) *Use of logarithmic table and calculator is **allowed**.*
 - 4) *Actual calculations **must be** shown while solving problems.*

1. Answer the following: **10**

- a) Define pseudomolecular reaction.
- b) Why CO_2 does not show rotational spectra ?
- c) State law of constancy of interfacial angles.
- d) Explain the term molar refraction.
- e) A first order reaction is 50% complete in 50 minutes. Calculate the rate constant.
- f) State Grotthus Draper law.
- g) Find the miller indices of crystal plane which cuts the three axes at multiple unit distance $3/2$, $1/2$ and ∞ .
- h) A certain system absorbs 5×10^{-4} einstein of light in given time. It is observed that one millimole of substance have reacted in the same time. Calculate the quantum yield.
- i) Show that for a second order reaction, half life $(t_{1/2}) = \frac{1}{ak}$.
- j) Calculate reduced mass of $^{14}\text{N}^{16}\text{O}$ molecule (Avagadros No : 6.023×10^{23}).

2. A) Attempt the following (**any two**): **6**

- i) Distinguish between order and molecularity of chemical reaction.
- ii) What are the applications of Raman spectra ?
- iii) State and explain the phenomenon of polymorphism ?

P.T.O.



B) Solve **any one** of the following :

4

- i) Find the type of cubic lattice of a crystal when the first order reflection from 100, 110 and 111 planes occur at angle 7.2° , 10.2° and 12.5° respectively.
- ii) Calculate the energy in ergs, joules and calories for one quantum of radiation with wavelength 6000 \AA .

3. Answer **any two** of the following :

10

- i) Derive an integrated rate expression for the first order reaction. Determine the unit of rate constant.
- ii) Define the term Dipole moment. Give its unit. Describe any one method for the determination of dipole moment.
- iii) Describe Bragg's Method for the determination of crystal structure.

4. A) What is actinometer ? Discuss with example the working and use of chemical actinometer.

6

OR

A) Describe briefly rotational spectra of simple diatomic molecule.

B) Solve **any one** of the following :

4

- i) Thermal decomposition of a compound is first order. If 50% of the sample of the compound is decomposed in 120 minutes. How long it will take for 90% of the compound to decompose ?
- ii) The density of acetic acid is 1.054 gm/cc and the refractive index for Na-D line is 1.3722 at 20°C . Calculate molar refraction of acetic acid. (At. wts. : C = 12, O = 16, H = 1).



[3817] – 716

T.Y.B.Sc. (Semester – III) Examination, 2010
CHEMISTRY
CH-332 : Inorganic Chemistry (Paper – II)
(2004-Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Actual calculations must be shown while solving the problems.*
4) *Marks are reserved for neat and labelled diagrams.*
5) *Atomic numbers : He (2), Li (3), O (8), Cr (24), Fe (26), Co (27).*

1. Attempt the following : **10**
- I) What is the magnetic nature of Li_2 molecule ?
 - II) Give the MO electronic configuration of C_2 molecule.
 - III) What is the coordination number of Al in $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)]$?
 - IV) Why $[\text{Fe}(\text{CO})_5]$ is non-electrolyte ?
 - V) Draw the structure of trans – $[\text{Cr}(\text{en})_2\text{Cl}_2]$.
 - VI) Determine EAN of Cr in $[\text{Cr}(\text{NH}_3)_6]\text{SO}_4$.
 - VII) What type of hybridisation is involved in $[\text{FeF}_6]^{3-}$?
 - VIII) Whether the d^6 ion in weak octahedral field is paramagnetic or diamagnetic ?
 - IX) Calculate CFSE in terms of Dq of d^3 ion in octahedral field.
 - X) What is the symmetry symbol for d-orbitals directed in between the axis ?
2. A) Answer **any two** of the following : **6**
- I) Write the IUPAC name of following complexes :
 - a) Potassium hexacyanoferrate (III)
 - b) Chloroaquo bis (ethylenediammine) cobalt (III) chloride
 - c) Tetrammine- μ -dichlorodiplatinum (II) chloride.
 - II) What are bonding, non-bonding and antibonding molecular orbitals ?
 - III) Discuss the bonding in $[\text{Fe}(\text{CO})_5]$ with the help of VBT.

P.T.O.



- B) Distinguish between **any two** of the following : **4**
- I) Atomic orbitals and molecular orbitals
 - II) CFT and MOT
 - III) Double salt and complex salt.
3. Answer **any two** of the following : **10**
- I) With the help of MO energy level diagram, explain the formation of O_2 molecule and comment how does bond order vary in O_2^+ , O_2^- and O_2^{-2} .
 - II) The distribution of electrons for d^8 to d^{10} configuration in an octahedral complex remain same in a strong field and weak field. Explain the statement with the help of d-orbital splitting diagram.
 - III) What is back bonding ? Explain $d\pi - p\pi$ and $d\pi - d\pi$ bonding.
4. A) Draw MO energy level diagram for $[CoF_6]^{3-}$ and comment on magnetic property. **6**
- OR
- A) Write short note on the following : **6**
- I) Spectrochemical series
 - II) Hydrate isomerism.
- B) Explain stepwise stability constant and overall stability constant. **4**
- OR
- B) Answer the following : **4**
- I) Why tetrahedral complexes do not show geometrical isomerism ?
 - II) Why He_2 molecule does not exist ?
-



[3817] – 717

T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY
CH-333 : Organic Chemistry (Paper – III)
(Old Syllabus – 2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw structures and neat diagrams if necessary.*

1. Answer the following : **10**
- i) Write the full name and structure of AAE.
 - ii) What are activators ? Give one example.
 - iii) Cis 1, 3 dimethyl cyclohexane is more stable than its trans isomer. Why ?
 - iv) Phthalimide is almost as acidic as phenol. Why ?
 - v) What is epoxidation ?
 - vi) Draw the zig-zag structure of penta-3-one.
 - vii) Tert.butyl benzene does not show hyperconjugation. Why ?
 - viii) Why RO^\ominus is a good nucleophile than R-OH ?
 - ix) Benzene undergoes substitution reactions rather than addition. Explain.
 - x) Kinetic isotopic effect is observed in E_2 reactions. Why ?
2. A) Answer **any two** of the following : **6**
- i) What is halogenation ? Discuss the mechanism of bromination to propylene.
 - ii) – NO_2 group is metaorientating while – CH_3 group is O/P orientating. Explain.
 - iii) What is resonance effect ? Explain the conditions necessary for resonance.

P.T.O.



B) Attempt **any two** of the following : **4**

- i) Tertiary substrate undergoes SN^1 reactions while primary substrate SN^2 . Explain.
- ii) Explain Huckel rule of aromaticity with examples.
- iii) What is hydroboration – oxidation of alkene ?

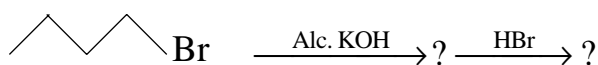
3. Attempt **any two** of the following : **10**

- i) Draw chair conformations of cis 1, 2 dimethyl cyclohexane. Comment on their stability and optical activity.
- ii) What is SN^2 reaction ? Explain the mechanism of SN^2 with supporting evidences.
- iii) What is inductive effect ? With the help of inductive effect explain the following :
 - 1) Chloroacetic acid is stronger acid than acetic acid.
 - 2) Dimethyl amine is stronger base than methylamine.

4. A) What is elimination reaction ? Explain E_1 mechanism with all supporting evidences. **6**

OR

- A) i) What is sulphonation ? Explain the mechanism of sulphonation of benzene. **3**
- ii) Discuss the mechanism of Friedel Craft alkylation of benzene. **3**
- B) i) Predict the products with justification. **4**



ii) What is meant by arynes ? Give any one example of its existence.

OR

- B) Write notes on : **4**
- i) Stereochemical aspects in SN^1 reaction.
 - ii) Saytzeff elimination.



[3817] – 719

T.Y. B.Sc. (Semester – III) Examination, 2010
CHEMISTRY (Paper – V)
CH – 335 : Industrial Chemistry
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are compulsory.*
*2) Figures to the **right** indicate **full** marks.*
*3) Draw **neat** diagram and flow sheet **wherever** necessary.*

1. Answer the following : 10

- i) Explain the term “Capital Cost”.
- ii) Give two important uses of sulphuric acid.
- iii) What is nitrogenous fertilizer ?
- iv) Define the term “Affination”.
- v) Define the term “Elastomers”.
- vi) What is pollution control ?
- vii) Write the chemical reaction involved in the manufacture of Nitric acid by Ostwald process.
- viii) Urea is most popular nitrogenous fertilizer. Explain.
- ix) Explain the term “Vinegar”.
- x) Give two uses of PVC.

2. A) Attempt **any two** of the following : 6

- i) Explain the term conversion, yield and selectivity.
- ii) Write a note on “Byproducts of Sugar Industry”.
- iii) Distinguish between platinum and Vanadium Catalyst in the manufacture of sulphuric acid.

P.T.O.



B) Attempt **any two** of the following : **4**

- i) Explain the unit process and unit operation.
- ii) SO_3 (Sulphur trioxide) is not directly absorbed in water, Explain.
- iii) What are qualities of a good fertilizer.

3. Answer **any two** of the following : **10**

- i) What are mixed fertilizers ? Discuss the manufacture of mixed fertilizer with flow sheet.
- ii) Describe the method of preparation, properties and uses of
 - i) Nylon-66
 - ii) Polyethylene.
- iii) What is fermentation ? Discuss with flow sheet the basic operations involved in fermentation.

4. A) Describe with flow sheet the manufacture of ammonia by Haber-Bosch process. **6**

OR

Discuss with flow sheet the manufacture of raw sugar with special reference to multiple effect evaporator.

B) Explain in detail the Vulcanisation of natural rubber. **4**

OR

What is Absolute alcohol ? How it is prepared ? What are uses of absolute alcohol.



[3817] – 721

T.Y. B.Sc. (Semester – III) Examination, 2010
BOTANY (Paper – I) (Old Course) (2004 Pattern)
BO – 331 : Biology of Lower Cryptogams

Time : 2 Hours

Max. Marks : 40

Instructions : All questions are compulsory.

Draw neat labelled diagrams wherever necessary.

Figures to the right indicate full marks.

I. Answer the following : 10

- a) Mention the type of pigments in chlorophyta.
- b) Give two examples of colonial algae.
- c) What is anisogamy ?
- d) What are the criteria used by G. M. Smith for classifying algae ?
- e) Give two examples of algae used as biofertilizer.
- f) Give any two general characters of ascomycetes.
- g) Write any two names of edible fungi.
- h) What are obligate parasites ?
- i) What is meant by macrocyclic rust ?
- j) What is synnemata ?

II. Attempt **any two** of the following : 10

- a) Describe the external structure of Batrachospermum.
- b) Describe the structure of globule in Chara.
- c) Write an account of aecial stage of Puccinia.

P.T.O.

[3817] – 721



III. Write notes on **any two** of the following :

10

- a) Algae as food
- b) Contribution of K. C. Mehta
- c) Structure of perithecium.

IV. Describe in detail the sexual reproduction in Sargassum.

10

OR

Describe asexual reproduction in Penicillium. Add a note on its economic importance.

10

B/II/10/270



[3817] – 722

T.Y. B.Sc. (Semester – III) Examination, 2010
BOTANY (Paper – II)
BO-332 : Biology of Higher Cryptogams
(2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

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

1. Answer the following : 10
- Give any two uses of moss.
 - Write the function of scales in class Hepaticopsida.
 - What types of rhizoides found in Marchantia ?
 - Give two points of difference between the sporophyte of Anthoceros and Marchantia.
 - Sketch and label the parts of archegonium of Funaria.
 - Give any two characters of Pterophyta.
 - What is Synangium ?
 - What is meant by plectostele ?
 - Which type of stele is found in rhizome of Marsilea ?
 - What is heterospory ?
2. Attempt **any two** of the following : 10
- Describe internal structure of Anthoceros thallus.
 - Write about internal structure of Lycopodium stem.
 - Describe the external morphology of gametophyte of Marchantia.

P.T.O.



3. Write short notes on (**any two**) : **10**
- a) L.S. of Lycopodium strobilus.
 - b) Female branch of Funaria.
 - c) Gametophyte of Psilotum.
4. Describe external and internal structure of sporocarp of Marsilea. **10**

OR

Explain the process of evolution of sporophytes in bryophyte by progressive sterilization with suitable examples. **10**



[3817] – 724

T.Y. B.Sc. (Semester – III) Examination, 2010
BOTANY (Paper – IV)
BO-334 : Cell Biology and Biometrics
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions: i) *All questions are compulsory.*
ii) *Draw neat labelled diagrams wherever necessary.*
iii) *Figures to the right indicate full marks.*

1. Attempt the following : 10
- a) Define median.
 - b) Give any two functions of ribosomes.
 - c) Lysosomes are called suicide bags of cell. Why ?
 - d) Give formula for nucleoplasmic index.
 - e) Mention any two differences between SER and RER.
 - f) What are metacentric chromosomes ?
 - g) Mention any two applications of probability.
 - h) What is standard deviation ?
 - i) Define regression.
 - j) What is range ?
2. Answer **any two** of the following : 10
- a) Give a comparative account of prokaryotic and eukaryotic cells.
 - b) Describe ultrastructure of a mitochondrion.
 - c) Write applications of Chi-square test.

P.T.O.



3. Write short notes on **any two** the of following : **10**
- a) Normal distribution.
 - b) Applications of correlation
 - c) Functions of plasma membrane.
4. What is mitosis ? Explain various phases of mitosis with suitable diagrams. **10**

OR

What is sampling ? Explain different methods of random sampling. Mention their advantages and disadvantages.



[3817] – 725

T.Y.B.Sc. (Semester – III) Examination, 2010
BOTANY (Paper – V)
BO-335 : Microbiology and Plant Pathology
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Neat labeled diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Answer the following :

10

- a) Define microbiology.
- b) Name any two bacterial diseases of plants.
- c) Write any two characteristic features of Mycoplasma.
- d) Give any two uses of fungi.
- e) What is epidemics ?
- f) Name the pathogen causing Downy Mildew of grapes disease.
- g) Define IPM.
- h) Name any two simple stains used in staining bacteria.
- i) Give any two industrial applications of micro organisms.
- j) Define pathogen.

2. Attempt **any two** of the following :

10

- a) Give the ultrastructure of fungal hypha.
- b) Explain the role of micro-organisms in N_2 fixation.
- c) Explain disease cycle with reference to disease epidemiology.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Staining methods of micro-organisms
 - b) Food processing
 - c) Tobacco mosaic virus.
4. Give an account of citrus canker and black stem rust of wheat disease with reference to causal organism, symptoms and control measures. **10**

OR

10

Describe serial dilution method for pure culture of pathogen.



[3817] – 729

T.Y. B.Sc. (Semester – III) Examination, 2010
ZOOLOGY (Paper – III) (2004 Pattern)
ZO- 333 : Environmental Biology and Toxicology
(Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are compulsory.*
2) Neat labelled diagrams must be drawn wherever necessary.
3) Figures to the right indicate full marks.

1. Attempt the following : **10**
- 1) What is ecology ?
 - 2) Name any two major ecosystems.
 - 3) Define the term 'pollution'.
 - 4) Name any two sources of soil pollution.
 - 5) What is wild life ?
 - 6) What is smog ?
 - 7) Define toxicokinetics.
 - 8) Define productivity of an ecosystem.
 - 9) Define threatened species.
 - 10) What is forensic toxicology ?
2. Attempt **any two** of the following : **10**
- i) Describe effects of noise pollution.
 - ii) Describe effects of physiological state of toxicity.
 - iii) Explain factors responsible for wild life depletion.

P.T.O.

[3817] – 729



3. Write notes on **any two** of the following : **10**
- a) Environmental organizations and agencies.
 - b) Natural resources.
 - c) Environmental auditing.
 - d) National parks.
4. Write an account of sources and effects of air pollution. **10**

OR

What are food additives ? Explain adverse effects of food additives on human health.

B/II/10/285



[3817] – 731

T.Y. B.Sc. (Semester – III) Examination, 2010
ZOOLOGY : Paper – V : Cell Biology
ZO – 335 (Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) *All questions are compulsory.*
ii) *Neat labelled diagrams must be drawn wherever necessary.*
iii) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) Define eukaryotic cell.
 - 2) Define phagocytosis.
 - 3) What is chiasmata formation ?
 - 4) What is cristae ?
 - 5) Define necrosis.
 - 6) Give the function of microvilli.
 - 7) What are peroxisomes ?
 - 8) What are microfilaments ?
 - 9) What are nucleic acids ?
 - 10) Give the main function of ribosome.
2. Attempt **any two** of the following : **10**
- i) Distinguish between active and passive transport.
 - ii) What are intrinsic causes of cancer ?
 - iii) Describe in brief the types of endoplasmic reticulum.

P.T.O.



3. Write short notes on **any two** : **10**
- a) Phenomena of contact inhibition.
 - b) Polymorphism in golgi complex.
 - c) Lysosomes and diseases.
 - d) Functions of mitochondria.

4. What is meant by a lipid bilayer ? Describe the fluid mosaic model of plasmamembrane. **10**

OR

4. Describe the structure and function of the nucleolus. How is it formed ? **10**



[3817] – 733

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOLOGY (Paper – I)
G-L – 331 : Indian Stratigraphy – I (Old Course)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. : 1) All questions are compulsory.*
2) All questions carry equal marks.
3) Black figures to the right indicate full marks.
4) Neat diagrams must be drawn wherever necessary.

1. Answer the following in **2-3** lines :

- a) Give names of three physiographic divisions of India.
- b) Give geographical distribution of Precambrian rocks of Southern Indian Peninsula.
- c) What is the lithology of 'Chalk hills' ?
- d) What is 'Bhandara/Sakoli triangle' ?
- e) Give names of three main mountain ranges of Lesser Himalayas.
- f) Give the name of unconformity between Archaean Proterozoics.
- g) Give names of the formations of uppermost group of Cuddapah supergroup.
- h) Name the Craton in which rocks of Kurnool Group are found.
- i) Name any two economically important minerals/deposits found in Vindhyan Supergroup.
- j) Name any two Proterozoic formations of lower Purana occurring in Indian Peninsula. **10**

2. Write notes on (**any two**) :

- a) Salkhala group
- b) Stratigraphic succession of Lower Vindhyan
- c) Sargur Group. **10**

P.T.O.

[3817] – 733



3. Write notes on (**any two**) :

a) Iron Ore Group

b) Stratigraphic Succession of Sausar Group

c) Closepet granite.

10

4. Give geographic distribution, stratigraphic succession, lithology and economics of Delhi Super Group.

OR

Singhbhum Craton.

10

B/II/10/120



[3817] – 734

T.Y. B.Sc. (Sem. – III) Examination, 2010
GEOLOGY (Old Course)
Paper – II : GL - 332 : Petrology – I (2004 Pattern)

Time : 2 Hours

Total Marks : 40

- N.B. :**
- 1) *All questions are compulsory.*
 - 2) *All questions carry equal marks.*
 - 3) *Black figures to the right indicate full marks.*
 - 4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines. **10**
- a) What is meant by ‘Filter Press action’ ?
 - b) Name any two primary Magmas.
 - c) How is ‘Gas streaming’ helpful in Magma evolution ?
 - d) State the different ways in which mixing of Magmas takes place.
 - e) State the upper limits of metamorphism.
 - f) Define metamorphic facies.
 - g) Name any two minerals and rocks formed during thermal metamorphism.
 - h) What is ‘Schistosity’ ?
 - i) Name any two structures developed during regional metamorphism.
 - j) State the ‘Depth Zones’ of regional metamorphism.
2. Write notes on **any two** : **10**
- a) Selective nucleation.
 - b) Role of volatile constituents in igneous crystallisation.
 - c) Crystallisation of Fo-Fa system.

P.T.O.



3. Answer the following **any two** : **10**
- a) Plutonic metamorphism.
 - b) Textures and structures of metasomatic metamorphism.
 - c) Effects of thermal metamorphism on limestones and non-calcareous argillaceous sediments.

4. Define regional metamorphism. Give its characteristics and explain Barrovian Zones. **10**

OR

4. Write notes on :
- a) Chemical reactions during retrogressive metamorphism.
 - b) Diagnostic structures of thermally metamorphosed rocks. **10**



[3817] – 736

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOLOGY
Paper – IV : GL 334 : Economic Geology
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions :1) All questions are compulsory.

2) All questions carry equal marks.

3) Black figures to the right indicate full marks.

4) Neat diagrams must be drawn wherever necessary.

1. Answer the following in **2/3** lines :

10

- a) Pore spaces
- b) Geological prospecting
- c) Geophones
- d) Lava drain channels
- e) Tortion balance
- f) Fuel deposits
- g) Industrial minerals
- h) Examples of evaporation deposits
- i) Target rings of mineral distribution
- j) Hypothermal deposits.

P.T.O.



2. Answer **any two** of the following : **10**
- a) Wall rock alteration
 - b) Explain Geological prospecting
 - c) Explain deposition from ocean water.
3. Write short notes on **any two** : **10**
- a) Classification of metalliferous deposits
 - b) Stages of prospecting
 - c) Deposition from ground water.
4. Describe in detail the principle, instrument and field methods in gravity prospecting. **10**
- OR
4. Explain the principle and application of resistivity method of prospecting. **10**



[3817] – 737

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOLOGY (Paper – V)
GL-335 : Environmental Geology (Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Black figures to the right indicate full marks.*
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2/3** lines : **10**
- a) Enumerate various types of water pollution.
 - b) What is acid rain ?
 - c) Define biogeochemical cycle.
 - d) Enumerate different causes of flood.
 - e) Define biological environment.
 - f) What are main sources of pollution of soils ?
 - g) What are main causes of landslides ?
 - h) What is meant by ozone-layer depletion ?
 - i) What is bad land topography ?
 - j) Name the chemicals that get concentrated in the soils due to over irrigation.
2. Answer **any two** of the following : **10**
- a) Describe the physical environment.
 - b) How can the risk of coastal erosion be minimized ?
 - c) Describe the nitrogen cycle.

P.T.O.



3. Write notes on **any two** : **10**
- a) Hygiene and sanitation during floods.
 - b) Various relief and rehabilitation measures taken after a major earthquake.
 - c) What is an avalanche ? Explain how does it affect the mankind in a hazardous way.

4. What are different types of volcanoes ? How do they originate ? Describe in detail pyroclastic activity, toxic gases and mudfloods. **10**

OR

4. Explain in detail the phenomenon of greenhouse effect. Add a note on preventing measures to be taken. **10**



T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal)
(Paper – I) ST-331 : Distribution Theory – I
(2004 Pattern) (Old Course)

Time: 2 Hours

Max. Marks: 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of scientific calculator and statistical tables is allowed.*
4) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following : **(1 each)**

i) If $(X_1, X_2, \dots, X_k) \sim MD(n, p_1, p_2, \dots, p_k)$, then variance of X_2 is

- A) np_2q_2 B) np_2q_1 C) $-np_1p_2$ D) np_2^2

ii) If X is a continuous random variable, then distribution function $F_x(x)$ follows

- A) $W(0, 1)$ distribution B) $U(0, 1)$ distribution
C) $N(0, 1)$ distribution D) Standard exponential distribution

iii) The probability density function of the largest order statistic $X_{(n)}$ is

- A) $n[1 - F(x)]^{n-1}$ B) $n[F(x)]^{n-1}$
C) $n[F(x)]^{n-1} f(x)$ D) $n[1 - F(x)]^{n-1} f(x)$

iv) If $X \sim W(\alpha, 1)$, then the mean of X is

- A) $\alpha\sqrt{2}$ B) $\sqrt{\frac{1}{\alpha} + 1}$ C) $\alpha^2\sqrt{\alpha + 1}$ D) $\alpha\sqrt{\alpha + 1}$

b) State whether each of the following statements is **true** or **false** : **(1 each)**

i) If $(X_1, X_2, X_3) \sim MD(20, 0.2, 0.3, 0.5)$, then the distribution of X_2 is Poisson.

ii) If $X \sim W(\alpha, \beta)$, then $P(x < a) = 1 - e^{-\left(\frac{a-\beta}{\alpha}\right)^2}$.

P.T.O.



- c) i) Define convergence in probability. 1
- ii) State Chebychev's theorem. 1
- d) i) Define r^{th} order statistic. 1
- ii) Give one real life situation where uniform distribution is used. 1

2. Attempt **any two** of the following : (5 each)

- a) Let $(X_1, X_2, \dots, X_k) \sim \text{MD}(n, p_1, p_2, \dots, p_k)$ Obtain the moment generating function of (X_1, X_2, \dots, X_k) and hence find the marginal distribution of X_2 .
- b) Let $X \sim W(\alpha, \beta)$. Obtain expression for third quartile of the distribution of X .
- c) Let X and Y be two independent $U(0, 1)$ variates. Obtain the distribution of $U = X + Y$.

3. Attempt **any two** of the following :

- a) Let $X_{(1)}, X_{(2)}, \dots, X_{(n)}$ be the order statistics corresponding to a random sample X_1, X_2, \dots, X_n of size n from a continuous distribution with probability density function $f(x, \theta)$ and distribution function $F_X(x)$. Derive probability density function of r^{th} order statistic, $X_{(r)}$. 5
- b) i) State Weak Law of Large Numbers (WLLN).
- ii) A continuous random variable X has probability density function given by
- $$f(x) = e^{-x}, \quad x > 0$$
- $$= 0, \quad \text{otherwise}$$
- Obtain the upper bound for $P(|X - E(X)| > 2)$ using Chebychev's inequality. Also find the actual value of this probability. (2+3)
- c) Let $X \sim U(a, b)$. Obtain moment generating function of X and the expression for r -th raw moment. 5



4. Attempt **any one** of the following :

- a) i) State and prove the central limit theorem for independent and identically distributed random variables based on moment generating function approach. **7**
- ii) Let $X_{(1)}, X_{(2)}, X_{(3)}, X_{(4)}$ be the order statistics corresponding to a random sample of size 4 from $U(0, 1)$ distribution. Find $P\left(\frac{1}{3} < X_{(3)} < \frac{2}{3}\right)$. **3**
- b) i) Let X_1, X_2, \dots, X_n be a random sample from exponential distribution with mean 1. Obtain the joint probability density function of $[X_{(1)}, X_{(n)}]$ and state the distribution of sample range R . **5**
- ii) State and prove Chebychev's inequality for a continuous random variable X with $E(X) = \mu$ and $\text{Var}(X) = \sigma^2 < \infty$. **5**
-



[3817] – 740

T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Paper – II) (Principal)
ST-332 : Theory of Estimation
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :*
- i) *All questions are compulsory.*
 - ii) *Figures to the right indicate full marks.*
 - iii) *Use of scientific calculator and statistical tables is allowed.*
 - iv) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) In **each** of the following cases, choose the correct alternative : **(1 each)**

i) If T is an unbiased estimator of the parameter θ , then

- A) $MSE(T) > V(T)$ B) $MSE(T) < V(T)$
C) $MSE(T) = V(T)$ D) $MSE(T) = 1/V(T)$

ii) Neyman's factorization theorem is applied for testing

- A) consistency B) sufficiency
C) unbiasedness D) efficiency
of an estimator.

iii) If X_1, X_2, \dots, X_n is a random sample (r.s.) from $U(0, \theta)$ then the m.l.e. of θ is

- A) $X_{(1)}$ B) $X_{(n)}$ C) $\frac{X_{(1)} + X_{(n)}}{2}$ D) $\frac{X_{(n)}}{2}$

iv) If T_1 and T_2 are two unbiased estimators of θ , then the relative efficiency of T_1 with respect to T_2 is given by

- A) $V(T_1)/V(T_2)$ B) $V(T_2)/V(T_1)$
C) $\sqrt{\frac{V(T_1)}{V(T_2)}}$ D) $\sqrt{\frac{V(T_2)}{V(T_1)}}$

P.T.O.



b) In **each** of the following cases, state whether the given statement is **true** or **false** : (1 each)

- i) An estimator is consistent if its bias tends to zero and variance tends to unity, as the sample size tends to infinity.
- ii) An m.l.e. may be a biased estimator of the population parameter.

c) Attempt the following : (1 each)

- i) Define likelihood as a function of the parameter θ for a random sample from a continuous distribution.
- ii) State any two properties of m.l.e.

d) Explain the following terms with an illustration **each** : (1 each)

- i) Estimator
- ii) Parameter space.

2. Attempt **any two** of the following : (5 each)

a) If X_1, X_2, \dots, X_n is a r.s. from $N(\mu, \delta^2)$, show that $S^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$ is an unbiased estimator of δ^2 .

b) A r.v. $X \sim p(\lambda)$. Show that sample mean is the MVBUE of parameter λ . Also verify that its variance attains the CRLB.

c) If X_1, X_2, \dots, X_n is a r.s. from $U(a, b)$, find estimators of a and b by the method of moments.

3. Attempt **any two** of the following : (5 each)

a) Show that sample mean is a consistent estimator of the population mean, if population variance is finite.

b) Obtain Fisher Information Function $I_n(\alpha)$ for a r.s. from $G(\alpha, \lambda)$ distribution, where λ is known.

c) Show that the sample mean \bar{X} is a sufficient statistic of parameter μ of $N(\mu, \delta^2)$ distribution where δ^2 is known. .



4. Attempt **any one** of the following :

- a) i) Obtain m.l.e. of θ for exponential distribution with mean θ . 5
- ii) State Pitman-Koopman form for finding sufficient statistic of a population parameter. Use it to obtain sufficient statistic of λ in case of Poisson distribution. 5
- b) i) State and prove Cramer-Rao inequality. 7
- ii) Give an illustration where there exist more than one unbiased estimators of the population parameter. 3



T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal) (Paper – VI)
ST 336 (A) : Operations Management
(Old Course) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of scientific calculator and statistical tables is allowed.*
4) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) In each of the following cases choose the correct alternative from the given alternatives. **(1 each)**

i) In PERT network the expected duration of an activity is given by

A) $\frac{t_o + 4t_m + t_p}{6}$

B) $\frac{t_o - 4t_m - t_p}{6}$

C) $\frac{t_o + 2t_m + t_p}{12}$

D) $\frac{t_o + 4t_m + t_p}{6}$

ii) The value of coefficient fo optimism (α) is needed in

A) Laplace criterion

B) Maximax criterion

C) Hurwitz criterion

D) Maximin criterion

iii) The total float of an activity is equal to the difference between

A) Latest start and earliest start times

B) Latest start and latest completion times

C) Latest completion and earliest completion times

D) Earliest start and earliest completion times



iv) In ABC analysis C type of items are those which has

- A) high consumption
- B) low consumption
- C) low usage value
- D) low unit price

b) In **each** of the following cases state whether the given statement is **true** or **false** : **(1 each)**

- i) PERT is activity oriented and CPM is event oriented
- ii) In decision making under uncertainty maximin criterion is the criterion of pessimism.

c) Define **each** of the following : **(1 each)**

- i) EMV of a strategy.
- ii) free float of an activity.

d) i) State the formula of average cost of an equipment which deteriorates gradually over a period of n years. **(1 each)**

ii) What is minimax regret criterion ?

2. Attempt **any two** of the following : **(5 each)**

a) Using the following data :

Activity	t_o	t_m	t_p
1 – 2	2	5	14
1 – 3	9	12	15
2 – 4	5	14	17
3 – 4	2	5	8
3 – 5	8	17	20
4 – 5	6	6	12

Draw the project network and hence determine critical path.

b) Write a note on FNSD analysis.



c) The purchase price of taxi is a Rs. 60,000/-. Its resale value decreases by Rs. 6,000/- every year. The operating cost every year is given below.

Year	1	2	3	4	5
Operating cost (Rs.)	1,000	12,000	15,000	18,000	20,000

What is the best replacement policy ?

3. Attempt **any two** of the following :

a) Derive an expression for economic lot size with uniform rate of demand, instantaneous replenishment and shortages allowed. **5**

b) The cost of a cake is Rs. 2 and it is sold at Rs. 4. Unsold cakes are given free to poor people at the end of the day. The probability distribution of the demand for the cakes is given below :

Demand :	15	16	17	18	19
Probability :	0.1	0.2	0.3	0.25	0.15

Determine the no. of cakes to be purchased in order to get maximum profit. **5**

c) i) Explain maximax and maximin criterion in decision making under uncertainty.

ii) Define (A) critical path (B) total float in network analysis. **(3+2)**

4. Attempt **any one** of the following :

a) i) A company has demand of 12000 units per year for an item and it can produce 2000 such items per month. The cost of one set up is Rs. 400 and the holding cost per unit per month is Rs. 0.15. Assuming the cost of one unit as Rs. 4, find the optimum lot size and the total cost per year. **5**



ii) Define each of the following :

5

- i) Latest start time
- ii) Earliest start time
- iii) Normal time
- iv) Crash time
- v) Crash cost.

b) Draw the network diagram from the following activities. Find total float and hence critical path.

10

Job	Time (days)	Immediate predecessor
A	13	-
B	8	A
C	10	B
D	9	C
E	11	B
F	10	E
G	8	D, F
H	6	E
I	7	H
J	14	G, I
K	18	J



T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal)
ST 336 (B) :Actuarial Statistics (Paper – VI)
(Old Course)(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to **right** indicate **full** marks.*
3) *Use of scientific calculator and statistical table is **allowed**.*
4) *Symbols and abbreviations have their **usual** meanings.*

1. a) In each of the following cases choose the correct alternative. (1 each)
- i) If i is the effective rate of interest, the nominal rate of interest when interest is paid in times per year $i^{(m)}$ is given by
 - A) $m(1+i)^m$
 - B) $m(1+i)^{1/m}$
 - C) $m[(1+i)^{1/m} - 1]$
 - D) $m[1+i]^m - 1$
 - ii) In equivalence principle premium P is found such that
 - A) $E(Z) = PE(Y)$
 - B) $E(PZ) = E(Y)$
 - C) $E(Z) = E(PY^2)$
 - D) $E(Z) = \frac{E(\sqrt{Y})}{P}$
 - iii) Force of mortality at age x , μ_x is given by
 - A) $\frac{s'(x)}{s(x)}$
 - B) $-\frac{s(x)}{s'(x)}$
 - C) $\frac{s(x)}{s'(x)}$
 - D) $-\frac{s'(x)}{s(x)}$
 - iv) Under the assumption of uniformity of deaths in unit interval of time, μ_{x+t} is given by
 - A) $\frac{q_x}{1+ tq_x}$
 - B) $\frac{q_x}{tq_x}$
 - C) $\frac{q_x}{1- tq_x}$
 - D) $\frac{q_x}{(1-t)q_x}$



- b) In **each** of the following cases state whether the given statement is **true** or **false** : **(1 each)**
- i) Speculative risk can be insured.
 - ii) Loss at issue at time t denoted by $I(t)$ is decreasing function of t .
- c) Explain **each** of the following terms : **(1 each)**
- i) Insurer
 - ii) Utility function.
- d) Give meanings of the following symbols **(1 each)**
- i) \bar{a}_x
 - ii) $K(x)$.

2. Attempt **any two** of the following : **(5 each)**

- a) Obtain the probability density function $g(t)$ in terms of ${}_tP_x$ and μ_{x+t} .
- b) Mortality rates (q_x) of a certain type of population are given below :

Age in years	0	1	2	3	4	5	6
q_x	0.1	0.2	0.3	0.5	0.6	0.8	1.0

Prepare the columns l_x , L_x and T_x for a radix of 10,000. What is the probability that an individual from this radix will survive atleast 3 years ?

- c) For a fully continuous whole life insurance 1 on (X) , you are given that $\mu_x(t) = 0.04; t \geq 0$ and $\bar{A}_x = 0.4$. If premiums are determined by equivalence principle, calculate the variance of the loss L .

3. Attempt **any two** of the following : **(5 each)**

- a) Under the assumption of uniform distribution of deaths in unit interval of time

$l_{48} = 8910, l_{49} = 8800, l_{50} = 8560$, find :

- i) ${}_{1.5}P_{48}$
- ii) $\mu_{49.5}$



b) Under the assumption of a constant force of mortality μ and of a constant force of interest δ show that

$$P[\bar{a}_{\overline{T}|} > \bar{a}_x] = \left(\frac{\mu}{\delta + \mu} \right)^{\mu/d}$$

c) Explain the term ‘annuity’ giving one illustration. Also explain any two forms of annuity related to life insurance.

4. Attempt **any one** of the following :

a) I) Obtain $E(z)$ where z is net single premium in terms of v for n year term insurance, whole life insurance and n year pure endowment insurance. **5**

II) With effective rate of interest 8% per annum, obtain the following :

i) Nominal rate of interest convertible 6 monthly

ii) Effective rate of discount

iii) Accumulated value of Rs. 10,000 at the end of 4th year

iv) Present value of Rs. 20,000 due after 3rd year. **5**

b) I) Derive the condition for mutually advantageous insurance policy in terms of one time premium G and expected value of loss random variable μ stating the assumptions you make. **5**

II) Explain the term ‘actuary’ and state his role in an insurance company. **3**

III) Explain in brief the concept of equivalence principle used to find premium. **2**



[3817] – 745

T.Y. B.Sc. (Semester – III) Examination, 2010
STATISTICS (Principal) Paper – VI
ST 336 (C) : Statistical Computing using R Software (Online Paper)
(2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Each question is to be solved using R software installed on your computer.*
4) *Attach computer print out of your work to the answer book supplied to you.*

1. Attempt **each** of the following : **(1 each)**
- a) A vector x contains elements 5, 2, 7, 9, 12, 8, 4, 16, 3, 14. Create a vector y from x containing elements of x which are greater than 8.
 - b) Find arithmetic mean and median of following observations :
5, 2, 8, 9, 17, 11, 15, 10, 3, 20.
 - c) Simulate an experiment of tossing a die 50 times and prepare its frequency distribution.
 - d) Draw rod plot for the following data :
 x : 2 4 6 8 10
 f : 9 13 27 16 5
 - e) Draw a random sample of size 10 from a Poisson distribution with mean 5.2.
 - f) Let $X \sim N(\mu = 12, \sigma^2 = 3)$ Find $P[X \leq 2]$ and $P[X \geq E(X)]$
 - g) Draw a simple random sample of size 5 from a population of 20 units by SRSWR method.
 - h) Create a data frame of roll number and marks (out of 10) of 5 students.
 - i) Draw a box plot of following observations :
13, 10, 9, 4, 2, 17, 27, 35, 32, 18, 23, 27, 21, 20, 7.
 - j) Create a vector of integers between 1 and 100 which are divisible by 7.

P.T.O.



2. Attempt **any two** of the following : **(5 each)**

a) Draw histogram and frequency polygon for the following data :

Length of rod No. of rods
(in inches)

0 – 5	7
5 – 10	8
10 – 15	32
15 – 20	9
20 – 25	2

b) Fit a straight line $Y = a + b X$ to the following data :

X : 23 27 35 45 52

Y : 75 89 64 80 81

Also find estimate of Y for each given X.

c) Compute geometric mean and harmonic mean of following observations :

23, 32, 55, 67, 27, 34, 45, 52, 50, 61

3. Attempt **any two** of the following : **(5 each)**

a) Fit a binomial distribution to the following data :

x : 0 1 2 3 4 5

f : 2 8 14 32 23 3

Also find expected frequencies. Plot observed and expected frequencies and test adequacy of model.

b) The heights of 10 female students in a college are found to be

55, 60, 57, 56, 61, 52, 49, 63, 54, 51

Is it reasonable to believe that average height of female student is greater than 50 inches ? Take $\alpha = 0.05$.

c) Draw a simple bar diagram for the following data :

Year : 2002 2004 2006 2008

Annual Sales(in lakh Rs.) : 13.7 15.8 16.2 15.9



4. Attempt **any one** of the following :

a) i) Following are data on height (cms) and weight (kgs) of 7 students.

Height (X) : 120 118 117 122 116 113 122

Weight (Y) : 43 40 39 46 47 41 45

Find correlation coefficient (r) between X and Y. **4**

ii) Find Karl Pearson's coefficient of skewness for the following data :

Marks : 5 – 10 10 – 15 15 – 20 20 – 25 25 – 30

No. of Students : 2 7 23 13 5 **6**

b) i) Draw a pie chart for the following data :

Department : A B C D E

No. of workers : 510 230 400 170 360 **5**

ii) A group of 50 girls and 40 boys was asked to give their preference between two brands of mobile hand sets. The results obtained are as follows : **5**

	Brand I	Brand II
Boys	23	17
Girls	20	30

Test at 5% level of significance whether preference of a particular brand is independent of sex.



[3817] – 746

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOGRAPHY (Paper – I)
Gg-331 : Resources and Environment
2004 Pattern (Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Diagrams and maps must be drawn wherever necessary.*
4) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences. **10**

- a) What is a resource ?
- b) State two advantages of wind energy.
- c) State two characteristic features of tropical rainforests.
- d) Name two biotic resources.
- e) State two disadvantages of coal as an energy resource.
- f) Name two components of resources.
- g) Name two methods of forest conservation.
- h) What is over exploitation of a resource ?
- i) Name two exhaustible energy resources.
- j) Name two advantages of forests as a resource.

2. Write short answers (**any two**) : **10**

- a) What are the essential conditions necessary for the establishment of H.E.P. plants ?
- b) Distribution of coal and petroleum resources.
- c) Effects of the overexploitation of resources.

P.T.O.



3. Write short notes on (**any two**) : **10**
- a) Renewable resources.
 - b) Nuclear energy.
 - c) Effects of deforestation.
4. Compare and contrast lumbering activities in the coniferous forest area and the equatorial rainforest area. **10**

OR

Discuss the different parameters to measure the quality of human resources.



[3817] – 747

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOGRAPHY (Paper – II)
Gg – 332 : Geography of Tourism (Old Course)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*
ii) *Figures to the **right** indicate **full** marks.*
iii) *Diagrams and maps must be drawn **wherever** necessary.*
iv) *Use of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- Define tourism.
 - State any two cultural benefits of tourism.
 - What is recreation ?
 - Mention any two purposes of travel in India.
 - State any two elements of tourism.
 - What is group tourism ?
 - Name any two hill stations from Western Maharashtra.
 - Why are metro cities major tourist attractions ?
 - Name any two characteristic features of an ideal tourist guide.
 - What is rail yatri bhavan ?
2. Write short answers (**any two**) : **10**
- Differentiate an International tourist from a domestic tourist.
 - Discuss the role of geography in tourism.
 - Describe the importance of religious centres in tourism development.
3. Write notes on (**any two**) : **10**
- Tourism and National Integration.
 - Factors influencing choice of transport.
 - Types of hotels.
4. Explain, with suitable examples, the economic benefits of tourism. **10**
- OR
- Compare and contrast roadways with railways.
-



[3817] – 748

T.Y. B.Sc. (Semester – III) Examination, 2010
GEOGRAPHY (Paper – III)
Gg-333 : Fundamentals of Geographical Information System (GIS)
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:* 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) Diagrams and maps must be drawn **wherever** necessary.
4) Use of map stencils is **allowed**.

1. Answer the following questions in **one** or **two** sentences : **10**
- a) What is data input in GIS ?
 - b) What is the process of digitization in GIS ?
 - c) Define pixel in raster data model.
 - d) What is GPS ?
 - e) Mention fields of application of GIS.
 - f) What do you understand by ratio scale ?
 - g) Mention any two components of GIS.
 - h) What is spatial data ?
 - i) What do you mean run length encoding ?
 - j) What is DN value ?
2. Write short answers (**any two**) : **10**
- a) Write a note on non spatial data.
 - b) What are the measurements of scale ?
 - c) What are the sources of data in GIS ?

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Comparison of line and point data.
- b) Historical review of GIS.
- c) GIS softwares.

4. Define GIS and explain its data models giving suitable examples. **10**

OR

Describe applications of GIS giving suitable examples.



[3817] – 749

T.Y. B.Sc. (Geography) (Sem. – III) Examination, 2010
Gg-334 : GEOGRAPHY OF INDIA (Old Course) (Paper – IV)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Draw neat diagrams and sketches wherever necessary.*
iv) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentence : **10**
- a) What is the space relation of India with Bhutan ?
 - b) Mention the recent rock formations from India.
 - c) State major relief features of Deccan Plateau region.
 - d) What is bhabar ?
 - e) State any two measures for control of floods in North-East India.
 - f) Where in India, is the Am type of climate found ?
 - g) Why red soils need irrigation support for cultivation ?
 - h) What is regur ?
 - i) In which forest type is rhododendron found ?
 - j) What is sal forest ?
2. Write short answers (**any two**) : **10**
- a) Describe the weather associated with the winter season in India.
 - b) Give major forest types of peninsular India.
 - c) Comment on the Archaean system of rocks in India.

P.T.O.



3. Write short notes (**any two**) : **10**

a) Lateritic soils of Konkan and Sahyadri.

b) Floods of Ganga.

c) Strategic location of India.

4. Compare and contrast the Himalayan rivers with those from the peninsular India. **10**

OR

Describe the causes responsible for deforestation in India. Suggest conservation measures.



[3817] – 751

T.Y. B.Sc. (Semester – III) Examination, 2010

GEOGRAPHY (Paper – VI)

Gg. 336 : Fundamentals of Remote Sensing (Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B. : 1) All questions are compulsory.

*2) Figures to the **right** indicate **full** marks.*

*3) Diagrams and maps must be drawn **wherever** necessary.*

*4) Use of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences :

10

a) State the relationship between wavelength and frequency.

b) State the primary colours of wavelengths.

c) Mention the units in which wavelengths and frequency measurement.

d) What is pixel ?

e) What is photo nadir ?

f) What is the wavelength of visible spectrum ?

g) What is the Principle Point on an aerial photograph ?

h) State the formula for determination of scale of an aerial photograph.

i) What do you understand by EMS ?

j) What is side lap ?

P.T.O.



2. Write short answers (**any two**) : **10**
- a) What are atmospheric windows ?
 - b) What do you mean by false color composite ?
 - c) Explain Aerial photographs as central perspective projection.
3. Write short notes (**any two**) : **10**
- a) Sun synchronous satellite
 - b) Types of aerial photograph
 - c) Properties of electromagnetic radiation.
4. Write a brief note on historical development of remote sensing. **10**

OR

Describe geometry of an aerial photograph.



[3817] – 752

T.Y. B.Sc. (Semester – III) Examination, 2010
MICROBIOLOGY (Paper – I)
MB-331 : Medical Microbiology
(2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B. :* 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat labelled diagram wherever necessary.*

1. A) 1) The 2×2 contingency table is used as Framework of case control study – State – True or False.

2) Opisthotonus position is characteristic of disease _____

3) Name the selective media used for isolation of Neisseria.

4) What is ETEC ?

5) Name two distinct types of observational studies.

B) Match the following :

- | | |
|----------------------|---|
| 1) Cholecystitis | a) Syndrome-disease by <u>Helicobacter Pylori</u> |
| 2) Condylomata | b) Symptom of leprosy |
| 3) Chronic gastritis | c) Inflammation of gall bladder |
| 4) Cystitis | d) Symptom of syphilis |
| 5) Patchy anasthesia | e) Inflammation of urinary bladder |

2. Attempt **any two** :

1) Explain skin and soft tissue infections caused by strep.pyogens.

2) Draw neat labelled diagram of T.S. of skin.

3) Write short note on Tuberculin antigen.

P.T.O.



3. Attempt **any two** :

- 1) What is Cohort Study ? Write distinguishing features of cohort studies.
- 2) Explain various transport media for cholera vibrios.
- 3) Enlist diseases of liver with their causative agents.

4. Attempt **any one** :

A) Explain bacillary dysentery with reference to :

- a) Pathogenesis
- b) Laboratory diagnosis.

OR

B) Describe food poisoning caused by clostridium perfringens.



[3817] – 753

T.Y. B.Sc. (Semester – III) Examination, 2010
MICROBIOLOGY
MB – 332 : Genetics and Molecular Biology (Paper – II)
(2004 Pattern) (Old Course)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. A) Attempt the following (**all** sub-questions are **compulsory**) : **5**

- i) State True or False : Histones are acidic proteins.
- ii) State True or False : Natural transformation in Gram negative bacteria is associated with formation of blebs.
- iii) Okazaki fragments contain _____
 - a) Only RNA
 - b) Only DNA
 - c) RNA plus DNA
 - d) Parental DNA strands
- iv) Transduction process is mediated by _____
 - a) Free DNA
 - b) Phage
 - c) Cell to cell contact
 - d) Transposable elements
- v) In F– strain of E.coli, the F factor is _____
 - a) Autonomous
 - b) Integrated
 - c) Absent
 - d) Free with bacterial genes in it

1. B) Match the following : **5**

- | I | II |
|-------------------------|----------------------------------|
| 1) Supercoiled DNA | a) Phosphodiester bond formation |
| 2) Euchromatin | b) r II locus |
| 3) <u>E. coli</u> | c) High linking number |
| 4) T ₄ phage | d) Active genes |
| 5) Ligase | e) Artificial competence |

P.T.O.



2. Diagrammatically represent **any two** of the following : **10**
- a) Development of competence in Gram positive bacteria
 - b) Nucleosome
 - c) Breakage and copying model of recombination.
3. Attempt **any two** of the following : **10**
- a) Describe J. Cairn's experiment w.r.t. bacterial DNA replication.
 - b) Compare F^+ , F^- , Hfr and F' strains of E.Coli.
 - c) Explain cis-trans test of genetic function.
4. Attempt **any one** of the following : **10**
- a) What is specialized transduction ? Illustrate with the help of diagrams the formation of λ dg and λ dbio from prophage DNA.
 - b) Explain how "Interrupted Mating Experiment" was used to map genes in E.coli.



[3817] – 756

T.Y. B.Sc. (Sem. – III) Examination, 2010
MICROBIOLOGY
MB– 335 : Fermentation Technology (Old Course)
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat, labelled diagrams wherever necessary.*

1. A) Answer as per instructions :

- i) Define Buffer.
- ii) Give two examples of pH electrodes.
- iii) Define MIC.
- iv) Define DRT.
- v) Give significance of patent Act in one sentence.

B) Match the following :

A

B

- | | |
|-----------------------|----------------------------------|
| a) Carcinogenicity | i) O ₂ transfer rate |
| b) Biological assay | ii) Response Surface Methodology |
| c) Power/Unit volume | iii) Octadecanol |
| d) Media optimisation | iv) Ames test |
| e) Antifoam agent | v) Diffusion Assay |

2. Attempt **any two** :

- a) Describe Toxicity testing for fermentation products.
- b) Explain 'Recurring Expenses' with respect to fermentation economics.
- c) Discuss the advantages of Plackett-Burman design.

P.T.O.



3. Attempt **any two** :

- a) Describe the different levels of Scale Up.
- b) Describe the monitoring and control of temperature in fermentation.
- c) In strain improvement, explain revertants with suitable example.

4. Attempt **any one** :

- a) Describe various nitrogen sources used in fermentation media.
- b) Describe enzymatic assays for quantisation of fermentation products.



[3817] – 757

T.Y. B.Sc. (Semester – III) Examination, 2010
MICROBIOLOGY
(Paper – VI) (2004 Pattern) (Old Course)
MB-336 : Food and Dairy Microbiology

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are **compulsory**.*
*2) All questions carry **equal** marks.*
*3) Draw **neat** labelled diagrams **wherever** necessary.*

1. A) Match the following :

- | | |
|-----------------------------------|--------------------------|
| 1) Benzoate | a) Aflatoxin |
| 2) <u>A. Flavus</u> | b) Seafood |
| 3) <u>Bacillus cereus</u> | c) Chemical preservative |
| 4) <u>Vibrio. parahemolyticus</u> | d) Autolysis |
| 5) <u>Staphylococcus aureus</u> | e) Euterotoxin. |

B) State **true** or **false** :

- 1) Salmonella causes food infection.
- 2) Sweet curdling of milk is caused by Alcaligenes viscolactis.
- 3) Fermented foods are easy to digest.
- 4) TDT and TDP determine heat resistance of spoilage microbes in food.
- 5) pH of milk is changed in Mastitis.

2. Attempt **any two** :

- 1) Justify – temperature plays important role in pasteurization of milk.
- 2) Explain role of intrinsic factors in food preservation.
- 3) Differentiate between food infection and food poisoning.

P.T.O.



3. Attempt **any two** :

- 1) Give significance of fermented food.
- 2) Explain food preservation by chemicals.
- 3) Describe succession of microorganisms in milk.

4. Attempt **any one** :

- 1) Describe stormy fermentation and sweet curdling of milk.
- 2) Describe spoilage of a) Meat and poultry product, and b) Bread with respect to source, microbes, and mechanism.



[3817] – 758

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE

EL – 331 : Analog Circuits and Systems (Paper – I) (Old) (2004 Pattern)

Time: 2 Hours

Total Marks: 40

- Instructions :** 1) *All questions are compulsory.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of calculator is allowed.*

1. Attempt **all** of the following :

- a) Define slew rate of OPAMP. 1
- b) What are the applications of VCO ? 1
- c) State the difference between FET & BJT. 1
- d) List various operations performed by signal conditioning circuit. 1
- e) “Tachometers can be used for speed measurement”. Comment. 2
- f) “Schmitt trigger is a comparator circuit”. Comment. 2
- g) Calculate the value of capacitor needed for function generator using IC-8038 for 50% duty cycle, if $f_0 = 5 \text{ KHz}$ & $R = 500 \text{ ohm}$. 2
- h) Draw I/P and O/P waveforms for non-inverting zero crossing detector if α sine wave of 2V amplitude is applied ($V_{CC} = \pm 9V$). 2

2. Attempt **any two** of the following :

- a) Explain the working of DFM with necessary block diagram. 4
- b) Explain the term ‘clipping of signal’. Explain the action of clipping with suitable diagram. 4
- c) Draw a block diagram of DAS. What are its requirements ? 4

3. Attempt **any two** of the following :

- a) Draw a block diagram of instrumentation amplifier using 3 Op-amps. Derive an expression for its o/p voltage. 4
- b) What is peak detector ? Explain the working of negative peak detector. 4
- c) Explain the working of automatic gain control with necessary diagram. 4

P.T.O.



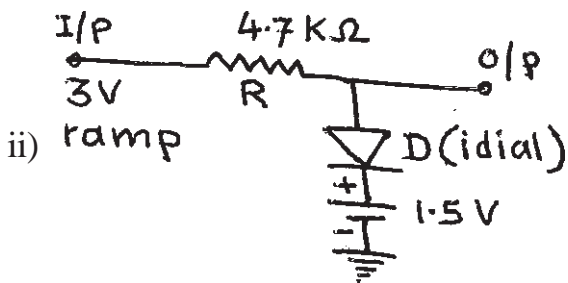
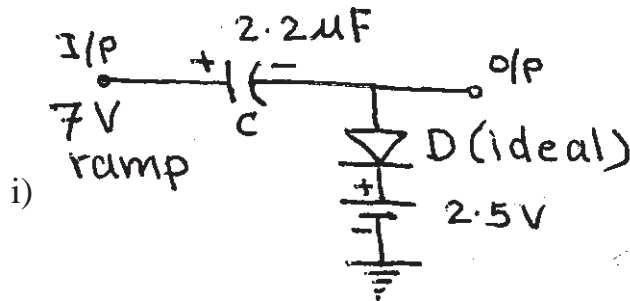
4. Attempt the following :

- a) Write a note on multichannel DAS. 6
- b) Explain the working of amplifier with digitally controlled gain. 6

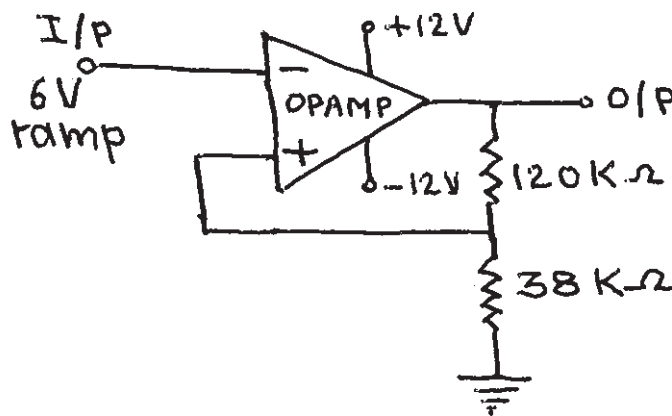
OR

4. Attempt the following :

- a) Design a second order low pass Butterworth filter for a cut-off frequency 4.7 KHz. 4
- b) Draw input and output waveforms for the following circuits : 4



- c) Draw waveform and determine upper and lower trigger points and hysteresis voltage for the following circuit : 4





[3817] – 759

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – II)
EL – 332 : Microcontrollers (Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of calculator is allowed.*

1. Answer **all** of the following :

- a) List the names of μ C 8051 manufacturers. 1
- b) State the address range of bank-0 of μ C 8051. 1
- c) Upon power-on reset, what is the content of PC ? 1
- d) Which instruction is used for returning from an interrupt service routine (ISR) ? 1
- e) List the salient features of μ C 8051. 2
- f) State the groups of instruction set of μ C 8051. 2
- g) How many independent keys can be interfaced to Port-0 of μ C 8051 ? 2
- h) List the general-purpose registers of μ P 8086. 2

2. Answer **any two** of the following :

- a) Give the comparison between microprocessor and microcontroller. 4
- b) Interface $4k \times 8$ data RAM to μ C 8051 and determine its memory map. 4
- c) State the addressing modes of μ C 8051 and explain any two of them with examples. 4

3. Answer **any two** of the following :

- a) With XTAL = 11.0592 MHz, find the TH1 value needed to have following band rates : 4
 - i) 2400
 - ii) 9600

P.T.O.



b) Interface 8-bit DAC to μC 8051 and write assembly program to generate the square waveform of 50% duty cycle at the output. **4**

c) Explain PSW/Flag register of μP 8086. **4**

4. Answer the following :

a) Write an assembly program that finds number of ones in a given byte. **6**

b) Explain the organization of internal RAM of μC 8051. **6**

OR

4. Answer **all** of the following :

a) Explain the internal circuitry of Port-1. **4**

b) Explain the steps taken by μC 8051 upon activation of an interrupt. **4**

c) Draw a circuit diagram for interfacing stepper motor to μC 8051. **4**

Define :

i) Step angle

ii) Holding torque.



[3817] – 760

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE (Paper – III)
EL 333 : Modelling and Simulation Using C and MATLAB
(Old) (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) Attempt **all** questions.
ii) Neat diagrams must be draw **wherever** necessary.
iii) Numbers to the **right** indicates **full** marks.
iv) Use of calculator is **allowed**.

1. Answer **all** of the following :

- a) Explain the meaning of statement # include < stdio.h > in ‘C’. 1
- b) Define two port network. 1
- c) State the meaning of MATLAB commands. 1
- i) quit ii) disp
- d) Define Laplace transform of a function. 1
- e) Explain poles and zeros of the network function N(s). 2
- f) Obtain Laplace transform of function $\sin \omega t$. 2
- g) What will be the output of following MATLAB commands ? 2
- $\gg A = [1 \ 2; 3 \ 4];$
- $\gg C = 2 * A$
- h) “The MATLAB commands $\gg A^{\wedge}2$ and $\gg A.^{\wedge}2$ are different”
comment. 2

2. Answer **any two** of the following :

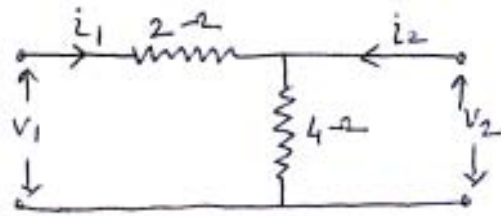
- a) Determine the inverse laplace transform of the function

$$F(s) = \frac{4s}{(s+2)(s-1)^2} \quad \text{4}$$

P.T.O.



b) Find 'h' parameters for the network given below. 4



c) Explain 2D graphical facility provided by MATLAB with suitable example. 4

3. Answer **any two** of the following :

a) Explain the features of FOR loop with its general format. 4

b) Obtain the Fourier coefficients a_0 and a_n for 4

$$f(t) = h, 0 < t < T/2$$

$$= 0, T/2 < t < T$$

c) Write the MATLAB commands to solve the following set of equations. 4

$$x + 2y + 3z = 1$$

$$3x + 3y + 4z = 1$$

$$2x + 3y + 3z = 2$$

4. Answer the following :

a) Derive the expression for Laplace transform of periodic functions. Find Laplace transform of the function. 6

$$F(t) = A, 0 < t < T$$

$$= -A, T < t < 2T$$

b) What is the purpose of scanf function ? How is it used in C program ? Compare it with getchar function. 6

OR



4. Answer the following :

- a) Write a C program to accept a decimal number n and convert it into binary. **4**
- b) Derive an expression for current through series RL circuit using Laplace transform. **4**
- c) Write a function in MATLAB to compute the sum of geometric series $1 + r + r^2 + r^3 + \dots + r^n$ for a given r and n, the input to the function are r and n. The output is sum of series. **4**



[3817] – 761

T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE
EL 334 : Electromagnetic Fields and Waves (Paper – IV)
(Old Course) (2004 Pattern)

Time: 2 Hours

Max. Marks: 40

- N.B. : 1) All questions are compulsory.*
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right indicate full marks.
4) Log table/calculator is allowed.

$$\text{Given : } \epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/\text{N} - \text{m}^2$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A} - \text{m}$$

1. Attempt **all** of the following :

- | | |
|---|---|
| a) Define electric field intensity. | 1 |
| b) State Ampere's circuital law. | 1 |
| c) What is reluctance ? | 1 |
| d) State the different parts of CRT. | 1 |
| e) Define magnetic susceptibility. State its unit. | 2 |
| f) Write the relation between \vec{P} , \vec{D} , \vec{E} . | 2 |
| g) What is current density and write equation of continuity. | 2 |
| h) What is polarization ? State types of polarization. | 2 |

2. Attempt **any two** of the following :

- a) Using Faraday's law of electromagnetic induction obtain the Maxwell's

equation $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ 4

- b) What is an electrical image ? State the technique of electrical image for solving problems in electrostatics. 4
- c) Describe the working principle of ink-jet printer. 4

P.T.O.



3. Attempt **any two** of the following :

- a) What is polarization of Electromagnetic waves ? Illustrate elliptical polarization. **4**
- b) Obtain the solution of Laplace equation in cartesian coordinate system. **4**
- c) Write short note on magnetic circuits. **4**

4. Attempt the following :

- a) The inductance of a closely wound coil is such that an emf of 2.5 V is induced when the current changes at a rate of 5A/sec. Calculate an inductance of a coil. **4**
- b) An Aluminium wire of 0.4 cm carries current of 25 Amp. Find the magnetic field induction at the surface of the wire. **4**
- c) A parallel plate capacitor of plate area 0.01m^2 is filled with dielectric material of dielectric constant 5. Its capacitance is 2 nF, 25 volts is applied across its plates. Find the electric field intensity in the dielectric. **4**

OR

- a) Define the terms reflection coefficient and transmission coefficient. Hence prove that $R_n + T_n = 1$ for normal incidence of plane wave. **6**
- b) Write the wave equation for electric field in conducting medium. Hence explain the concept of skin depth. **6**



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T.Y. B.Sc. (Semester – III) Examination, 2010
ELECTRONIC SCIENCE
EL – 335 (A) : Power Electronics – I (Old) (Paper – V)
(2004 Pattern)

Time: 2 Hours

Max. Marks: 40

Notes: i) All questions are compulsory.
ii) Figures to the right indicate full marks.
iii) Neat diagrams must be drawn wherever necessary.

1. Answer **all** of the following :

- | | |
|--|---|
| a) Give two important applications of Power Electronics. | 1 |
| b) What is latching current of SCR ? | 1 |
| c) Draw the symbol of GTO. | 1 |
| d) Which are bidirectional current power devices ? | 1 |
| e) “A fast recovery time is required in high speed applications of power electronics” – Comment. | 2 |
| f) Classify power electronic devices having MOSFET characteristic base. | 2 |
| g) What are types of dc-dc converter ? Give any two applications. | 2 |
| h) Calculate intrinsic stand off ratio of PUT for given data. $R_1 = 60\text{ K}\Omega$,
$R_2 = 30\text{ K}\Omega$. | 2 |

2. Attempt **any two** of the following :

- | | |
|--|---|
| a) Explain how RC circuit is used as snubber circuit for $\frac{dv}{dt}$ protection. Obtain necessary expression. | 4 |
| b) What is PUT ? Draw circuit diagram of relaxation oscillator using PUT, explain working with waveform, obtain expression for frequency of oscillation. | 4 |
| c) Explain how is phase-control thyristor turns on and off. Obtain expression for rms output voltage. | 4 |

P.T.O.



3. Attempt **any two** of the following :

- a) Define the following performance parameters of a rectifier **4**
 - i) Efficiency
 - ii) Form factor
 - iii) Ripple factor
 - iv) Transformer Utilization Factor
- b) What are advantages of static switch ? Explain working of SUS. **4**
- c) Explain single phase cycloconverter with proper circuit. **4**

4. Attempt **any two** of the following :

- a) Explain working of single phase semiconverter with proper circuit. **6**
- b) What are advantages of power MOSFETs ? Explain switching characteristics with waveform. **6**
- c) Draw circuit diagram of single phase dual converter. Explain forth quadrant operation of it. **6**



EL – 335 (B) : Principles and Applications of Sensors – I (Old)
Paper – V (2004 Pattern)

Time: 2 Hours

Max. Marks: 40

- N.B. :* i) Attempt **all** questions.
ii) **Numbers** to the right indicate full marks.
iii) Draw neat diagrams **wherever** necessary.

1. Answer **all** of the following :

- a) What is thermistor ? 1
- b) What is PTAT ? State its significance. 1
- c) What is magnetostriction ? 1
- d) State the names of poisonous gases. 1
- e) Comment 'Sensor is transducer but transducer is not sensor'. 2
- f) State difference between active and passive transducer. 2
- g) Give name of four radiation sensor. 2
- h) Comment 'Quality of air is indicated by the sensor'. 2

2. Answer **any two** of the following :

- a) How bath curve is associated with failure of transducer ? What are screening steps for sensor/transducer ? 4
- b) What are different types of transducer ? Explain transducer selection criterion. 4
- c) Discuss the formulation of equation for resistive element. 4

3. Answer **any two** of the following :

- a) What is MI thermocouple ? Explain its construction with proper diagram. 4
- b) Write short note on LVDT. 4
- c) How resistive transducer can be used for measurement of humidity ? Explain. 4



4. Answer **any two** of the following :

- a) What are different types of acoustic sensor ? Explain the transit time acoustic temperature sensor with proper diagram. **6**
- b) Describe the working principle of optical fibre liquid level measurement system. **6**
- c) What is LDR ? State commonly used photoresistive materials. How LDR is constructed ? What are its application ? **6**



EL – 335 (C) : Industrial Electronics - I (Paper – V)
(Old Course) (2004 Pattern)

Time: 2 Hours

Max. Marks: 40

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw a neat diagram wherever, necessary.*

1. Answer **all** of the following :
 - a) How the electric shock occurs ? 1
 - b) What is National Electrical Code (NEC) ? 1
 - c) What is a ladder diagram ? 1
 - d) Give the advantage of drafting tools. 1
 - e) “Standard racks and panels are designed for electronic equipments in research laboratory”, Comment. 2
 - f) What is PCB design criteria according to application ? Give one example. 2
 - g) Mention any two first-aid steps in case of bleeding from wound. 2
 - h) What are magnetic motor starters ? Give examples. 2

 2. Attempt **any two** of the following :
 - a) State the steps for fire prevention. Explain procedures to be followed in case of electrical fire. 4
 - b) What is a block diagram ? Draw a block diagram for 5 volt DC regulated power supply. 4
 - c) Write a short note on microswitch. 4

 3. Attempt **any two** of the following :
 - a) Discuss features of ORCAD in drafting electrical circuit and PCB manufacturing. 4
 - b) What are industrial standards for PCB manufacturing ? Discuss with suitable example. 4
 - c) With an example of regulated power supply, discuss standard panel and case design for dual power supply. 4

 4. Attempt **any two** of the following :
 - a) Discuss in detail clothing and equipments used for personal safety. 6
 - b) Define transducer, sensor. Explain in brief inductive proximity sensor. 6
 - c) List various materials used for PCB. Discuss use of typical material for double sided PCB. 6
-



**EL – 335 (D) : Computer Service Management – I (Old) (Paper – V)
(2004 Pattern)**

Time: 2 Hours

Max. Marks: 40

- Note :* 1) *All questions are compulsory.*
2) *Figures to right indicate full marks.*
3) *Draw neat diagram wherever necessary.*

1. **All** sub-questions are **compulsory**.
- a) Which factors define capacity of HDD ? 1
 - b) Where does BIOS files and core DOS resides afterloading ? 1
 - c) What is use of TV-tuner card ? 1
 - d) What is FAT ? 1
 - e) When a computer is said to be dead ? 2
 - f) What is function of DOS ? 2
 - g) “Desktops are more flexible than laptops with respect to add on card”.
Comment. 2
 - h) What is MODEM ? Why it is essential ? 2
2. Attempt **any two** of the following :
- a) What do you mean by encoding ? State various encoding schemes. 4
 - b) Discuss special features of HDD over FDD. 4
 - c) Write note on :
 - i) E-notebooks
 - ii) e-subnote books. 4
3. Attempt **any two** of the following :
- a) State difference between CD and DVD. 4
 - b) Explain installation and trouble shooting of sound card. 4
 - c) What is difference between GUI and CUI ? Explain in brief. 4
4. Attempt **any two** of the following :
- a) What is operating system ? State the main functions of operating system. 6
 - b) Give special features of window 2000. Compare parameters with win 98. 6
 - c) Write note on Voice MODEM. Explain various signals used in MODEM. 6
-



**EL – 335 (E) : Electronic Equipments Troubleshooting and Repairs – I (Old)
(Paper – V) (2004 Pattern)**

Time: 2 Hours

Max. Marks: 40

*N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.*

1. All sub-questions are **compulsory**.
 - a) Why circuit board should be grounded ? 1
 - b) What is the effect if switching transistor in SMPS is open ? 1
 - c) How will you test a switch using MM ? 1
 - d) How will you test a p-n junction diode using MM ? 1
 - e) What are main electrical hazards ? 2
 - f) State the effect of static charge on electronic equipment. 2
 - g) “Waveform displayed on CRO is not steady”. What is fault ? 2
 - h) If shunt capacitor at the output of filter circuit is leaky, what will be effect on output ? 2

2. Attempt **any two** of the following :
 - a) What is significance of half digit on digital multimeter ? Explain with suitable example. 4
 - b) What are possible reasons of non-functioning of voltage and current ranges in multimeter ? 4
 - c) Which instruments should be used for testing digital instruments ? Which are essential parameters ? 4

3. Attempt **any two** of the following :
 - a) What precautions should be taken while replacing IC’s in the circuit ? 4
 - b) How you test performance characteristic of Audio amplifier ? Which instruments should be used for testing ? 4
 - c) Describe procedure to test a transformer. 4



4. Attempt **any two** of the following :

- a) What do you mean by CVCC power supply ? How will you test it ? Explain CVCC power supply with block diagram. **6**
- b) How will you test operational amplifier circuit ? **6**
- c) Draw block diagram of CRT in a CRO. Explain function of each block. **6**



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T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – II)
DS-332 : Research Methodology and Project
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B.: i) **All** questions are **compulsory**.
ii) Figures to the **right** indicate marks.

1. Answer in **2** or **4** sentences : **16**

- 1) Define 'Social Research'.
- 2) Distinguish between social and physical sciences.
- 3) What is 'Historical Research' ?
- 4) Define 'Experimental Research'.
- 5) What is meant by 'Applied Research' ?
- 6) Define 'Hypothesis'.
- 7) What is meant by Research Design ?
- 8) What is the aim of Research ?

2. Answer in **8** to **10** sentences (**any two**) : **8**

- 1) Explain why research is conducted.
- 2) Explain about systematic process in research.
- 3) Discuss the relevance of research in defence and strategic studies.

P.T.O.



3. Write short notes on (**any two**) : **8**

1) Selection of problem.

2) Data analysis.

3) Report writing.

4. Answer in **16** to **20** sentences (**any one**) : **8**

1) What are the sources and origin of Hypothesis ? Explain.

2) Why research design is needed ? Discuss.



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T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES (Paper – V)
DS – 335 : Computer Application in Defence
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

N.B. : i) All the questions are compulsory.
ii) Figures to the right indicate marks.

1. Answer in **2 to 4** sentences **each** : **16**

- 1) Define Artificial Intelligence.
- 2) What do you mean by Computer Aided Instruction ?
- 3) State the meaning of control programme.
- 4) Write the meaning of Data Dictionary.
- 5) State the meaning of High level language.
- 6) Define Loop.
- 7) How do you define modem ?
- 8) Explain the meaning of Optical Character Reader (OCR).

2. Answer in **8 to 10** sentences **each (any two)** : **8**

- 1) Explain Evolution of computers.
- 2) Discuss fifth generation of computers.
- 3) Explain computer architecture.

P.T.O.



3. Write short notes on (**any two**) : **8**

1) Information science in high-tech war.

2) Programming language

3) Advantages of High level language.

4. Answer in **16** to **20** sentences **each** (**any one**) : **8**

1) Explain military application of computer.

2) Discuss advantages of IC technology over transistor technology.



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T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES : Paper – VII
DS-337 (A) : Maratha Art of War and Military System
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Answer in **2** or **4** sentences **each** : **16**
- 1) What do you know about Shivaji's born ?
 - 2) State any two political powers in Maharashtra during Shivaji's period.
 - 3) Write about capital port of Shivaji.
 - 4) What do you mean by Paga ?
 - 5) What do you know about Dadoji Konddev ?
 - 6) Write any two names of Shivaji's commrade.
 - 7) Who was Krishnaji Bhaskar ?
 - 8) What do you know about father of Shivaji ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Write in brief "Tactics" of Shivaji.
 - 2) Explain the concept of "Hindvi Sawarajya".
 - 3) Write in brief gains of Shivaji from Karnataka campaign.

P.T.O.



3. Write short notes on (**any two**) :

8

- 1) Baji Prabhu Deshpande.
- 2) Murar Baji
- 3) Shivaji as a Master of Guerrilla Tactics.

4. Answer in **18** to **20** sentences (**any one**) :

8

- 1) Explain the geostrategic importance of Jawali Territory and highlight on gains of Shivaji from “Battle of Jawali”.
 - 2) “Campaign of Mirza Raje Jaysingh against Shivaji was a milestone for Mughals as well as Shivaji”. Do you agree ? Justify your answer.
-



T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES : Paper – VII
DS-337 (B) : International Organisation
(2004 Pattern (Old))

Time : 2 Hours

Max. Marks : 40

N.B. : 1) All the questions are compulsory.
2) Figures to the right indicate full marks.

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Define International Organisation.
 - 2) Write any two characteristics of U.N.O.
 - 3) Define Diplomacy.
 - 4) State the meaning of common international interest.
 - 5) What were the main organs of the league of nations ?
 - 6) State the meaning of enforcement functions.
 - 7) Write any two social achievements of the U.N.O.
 - 8) Define collective security.
 2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Write note on Hague conferences.
 - 2) Explain organisation of the league.
 - 3) Discuss functions of the league.
 3. Answer in short **(any two)** : **8**
 - 1) Trusteeship council
 - 2) Security council
 - 3) Economic and social council.
 4. Answer in **16 to 20** sentences **each (any one)** : **8**
 - 1) Write a note on the achievements of the UNO.
 - 2) Explain peace keeping activities of the U.N. and U.N. Force.
-



T.Y. B.Sc. (Semester – III) Examination, 2010
DEFENCE AND STRATEGIC STUDIES : Paper – VII
DS-337 (C) : Evaluation of Western Art of War
(2004 Pattern (Old))

Time : 2 Hours

Max. Marks : 40

N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) What do you mean by Roman Legion ?
 - 2) What do you mean by emperor ?
 - 3) Between whom and why the battle of Zama it was fought ?
 - 4) What do you understand by “Cavalry” ?
 - 5) What do you mean by “Gun Powder” ?
 - 6) State the meaning of Tactics.
 - 7) Who introduced the professional army firstly in Europe ?
 - 8) State the duration of World War - I.
2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Write a few lines on “Phalanx”.
 - 2) Why the treaty of versaille it was signed ?
 - 3) Write in brief weapon system of Romans.
3. Write short notes on (**any two**) : **8**
 - 1) Greek art of war
 - 2) Engine of war
 - 3) Age of Cavalry.
4. Write an answer in **18 to 20** sentences (**any one**) : **8**
 - 1) Explain the battle of “Crecy” with special reference of the Revival of industry.
 - 2) Analyse the causes of World War – I.



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T.Y. B.Sc. (Semester – III) Examination, 2010
ENVIRONMENTAL SCIENCE (Old) (2004 Pattern)
ENV-333 : Environmental Chemistry

Time : 2 Hours

Max. Marks : 40

Instructions: 1) *All questions are compulsory.*

2) *Neat and labeled diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) Define biomagnification.
 - b) What is eutrophication ?
 - c) Give the fullform of IPM.
 - d) What is surfactant ?
 - e) Give the name of disease caused by cadmium toxicity.
 - f) What are water soluble vitamins ?
 - g) Which variety of crop introduced by Dr. Swaminathan ?
 - h) What is denitrification ?
 - i) What is DDT ?
 - j) What is meaning of additive effect ?
2. Write a short note on (**any two**) : **10**
- a) Pathway of pesticide in environment.
 - b) Adverse effects of detergents on aquatic environment.
 - c) Environmental significance of green revolution.

P.T.O.



3. Answer **any two** from the following : **10**
- a) Enumerate the Vitamins and give their respective deficiency diseases.
 - b) Explain symbiotic nitrogen fixation.
 - c) Explain the principle and working of pH meter.
4. Attempt **any one** of the following question : **10**
- a) What are the sources of air pollutants and explain the health hazards of air pollutants.
 - b) Explain the principle, working, block diagram and applications of gas chromatography.
-



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T.Y. B.Sc. (Semester – III) Examination, 2010
ENVIRONMENTAL SCIENCE
(Old) (2004 Pattern)
Course No-EN-335 : Course Title – Environmental Geoscience

Time : 2 Hours

Max. Marks : 40

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

1. Attempt the following in **1-2** lines **each** : **10**
- a) Define the term biosphere.
 - b) What is El-Nino ?
 - c) What is tropical cyclone ?
 - d) Enlist the segments of environment.
 - e) What is conventional energy resource ?
 - f) State the difference between nuclear fusion and fission with example.
 - g) Give any 2 types of coal.
 - h) What is wind mill ?
 - i) State any 2 principles of Tidal energy.
 - j) Write the names of regions where anticyclone originate.
2. Write short notes on **any 2** of the following : **10**
- a) Energy budget of Earth.
 - b) Hydal energy.
 - c) Seasons of India.

P.T.O.



3. Attempt **any 2** of the following : **10**
- a) What are the advantages and disadvantages of solar energy ?
 - b) Give the techniques for harnessing thermal energy.
 - c) Give any 5 differences between tropical and temperate cyclones.
4. Attempt **any one** of the following : **10**
- a) How to minimize the harmful effects of Nuclear energy ?
 - b) Explain the working of wind mill with diagram.
-



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T.Y. B.Sc. (Semester – III) Examination, 2010
INDUSTRIAL CHEMISTRY – V (Vocational)
VOC-IND-CH 335 : Inorganic and Organic Based Industries – I
(2004 Pattern) (Old)

Time : 2 Hours

Max. Marks : 40

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. Answer the following questions : 10
- a) Name the catalysts used in contact process.
 - b) Name two organo chlorine pesticides.
 - c) Give the composition of teargas.
 - d) Give the uses of baggasse.
 - e) How is phosphorous important to plants ? Give an example of phosphorus fertilizer.
 - f) Give the structure of RDX and state its uses.
 - g) What is oleum ?
 - h) Define pigment. Give two examples.
 - i) Give a list of useful fermentation products.
 - j) Give the uses of ammonia.
2. A) Attempt **any two** of the following : 6
- i) How is gun powder prepared ? Give its uses.
 - ii) Compare the properties of catalysts used in contact process.
 - iii) How is bone char revived ?
- B) Attempt **any two** of the following : 4
- i) What are the different types of pigments ? Give examples.
 - ii) Give methods of applying paints.
 - iii) Give the essential requirements of fertilizers.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- i) Coffey still.
 - ii) By product of sugar industry.
 - iii) Mixed fertilizer.
4. A) Describe the manufacture of refined sugar from raw sugar. **6**
- OR
- A) Describe the manufacture of nitrocellulose. **6**
- B) Attempt **any one** of the following : **4**
- i) Why is urea considered the best nitrogenous fertilizer ?
 - ii) What are herbicides ? Give examples and state its uses.



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T.Y. B.Sc. (Semester – III) Examination, 2010
STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION – VI
(Vocational)
Television Software (Old Course) (2004 Pattern)

Time: 2 Hours

Max. Marks: 40

- Instructions :* 1) Attempt *all* questions.
2) Draw *neat* and labeled diagrams *whenever* necessary.
3) Figures to the *right* indicate *full* marks.

1. Answer the following : **10**
- a) What is the difference between a reality show and a talent hunt show ? Explain.
- b) Name any four fiction programs on television.
- c) Explain the concept of SHOT.
- d) Explain the difference between a feature film and a short film.
- e) Explain the role of director in making any television production.
2. Answer **any two** of the following : **10**
- a) Explain different types of shot.
- b) Explain different steps involved in television production process.
- c) Explain what do you understand by the concept 'point of view' and also explain its creative use.
3. Write a script for 30 sec. social advertisement on the following theme in **drama format**. **10**
- “Manners to be followed while using mobile phone in public”.

OR

P.T.O.



3. Write a script for 30 sec. social advertisement on the following theme in **documentary format.** **10**
- “Manners to be followed while using mobile phone in public”.
4. Write short notes on **any two** : **10**
- a) Importance of screenplay.
 - b) Importance of characterization.
 - c) Importance of research.