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10MAT11

First Semester B.E. Degree Examination, June / July 2014
Engineering Mathematics – I

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1 a. Choose the correct answers for the following : (04 Marks)

i) If $y_n = (\sqrt{17})^n e^{4x} \cos\left(x + n \tan^{-1} \frac{1}{4}\right)$ then $y =$ _____

- A) $e^{4x} \cos x$ B) $e^{2x} \sin 3x$ C) $e^x \cos x$ D) None of these

ii) $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} \dots$ is,

- A) Taylor's series B) Exponential series C) Meclaurin's series D) None of these

iii) In the Rolle's theorem if $F'(c) = 0$ then the tangent at the point $x = c$ is,

- A) parallel to y-axis B) parallel to x-axis C) parallel to both axes D) None of these

iv) If $y = 3^x$ then $y_n =$ _____

- A) $(\log x)3^x$ B) $3(\log x)^n$ C) $3^n \log 3^x$ D) $3^x (\log_e 3)^n$

b. If $x = \sin t$, $y = \sin pt$ prove that, $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (p^2-n^2)y_n = 0$. (04 Marks)

c. State and prove Cauchy's mean value theorem in $[0, 16]$. (06 Marks)

d. Expand $\sqrt{1 + \sin 2x}$ by using Meclaurin's expansion. (06 Marks)

2 a. Choose the correct answers for the following : (04 Marks)

i) The value of $\lim_{x \rightarrow \infty} (1+x)^{1/x}$ is,

- A) e B) 1 C) $\frac{1}{e}$ D) ∞

ii) The angle between two curves $r = ae^{\theta}$ and $re^{\theta} = b$ is,

- A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) 0 D) π

iii) $\frac{ds}{dt} = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}$

- A) Polar form B) Parametric form C) Cartesian form D) None of these

iv) $\lim_{x \rightarrow \infty} \frac{\log x}{\cot x} =$ _____

- A) 1 B) 0 C) 2 D) -2

b. Find a & b, if $\lim_{x \rightarrow 0} \frac{x(1+a \cos x) - b \sin x}{x^3} = 1$. (04 Marks)

c. Find the pedal equation of the curve $r^2 = a^2 \cos 2\theta$ (06 Marks)

d. Find the radius of curvature at any point t of the curve $x = a(t + \sin t)$ and $y = a(1 - \cos t)$. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42.8 -- 50, will be treated as malpractice.

3 a. Choose the correct answers for the following :

- i) If $u = (x - y)^2 + (y - z)^2 + (z - x)^2$ then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ is,
 A) 1 B) 24 C) $2(x + y + z)$ D) 0
- ii) $e^x \cos y = \frac{e}{\sqrt{2}} \left[1 + (x-1) - \left(y - \frac{\pi}{4} \right) + \frac{(x-1)^2}{2} - (x-1) \left(y - \frac{\pi}{4} \right) - \frac{1}{2} \left(y - \frac{\pi}{4} \right)^2 \right] + \dots$
 A) $\left(1, \frac{\pi}{4} \right)$ B) $(0, 0)$ C) $(1, 1)$ D) $\left(\frac{\pi}{4}, 1 \right)$
- iii) At (a, b) $\frac{\partial^2 u}{\partial x^2} = A$, $\frac{\partial^2 u}{\partial y^2} = B$ and $\frac{\partial^2 u}{\partial x \partial y} = H$ and if $AB - H^2 < 0$ then such a point is called,
 A) Maximum B) Minimum C) Saddle D) Extremum
- iv) If $J = \frac{\partial(u, v)}{\partial(x, y)}$, $J' = \frac{\partial(x, y)}{\partial(u, v)}$, then JJ' is,
 A) 0 B) 2 C) ∞ D) 1
- b. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$. (04 Marks)
- c. If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$, $w = \frac{zx}{y}$ then show that $J\left(\frac{u, v, w}{x, y, z}\right) = 4$ verify $JJ' = 1$. (06 Marks)
- d. For the kinetic energy $E = \frac{1}{2}mv^2$ find approximately the change in E as the mass m changes from 49 to 49.5 and the velocity 'v' changes from 1600 to 1590. (06 Marks)

4 a. Choose the correct answers for the following :

- i) The value of $\nabla \times \nabla \phi$ is, (04 Marks)
 A) 0 B) \vec{R} C) ϕ D) 3
- ii) Any motion in which the curl of the velocity vector is zero, then the vector \vec{v} is said to be,
 A) Constant B) Solenoidal C) Vector D) Irrotational
- iii) In orthogonal curvilinear co-ordinates the Jacobian $J = \frac{\partial(x, y, z)}{\partial(u, v, w)}$ is,
 A) $\frac{h_1}{h_2 h_3}$ B) $\frac{1}{h_1 h_2 h_3}$ C) $h_1 h_2 h_3$ D) $\frac{h_3}{h_1 h_2}$
- iv) A gradient of the scalar point function ϕ , $\nabla \phi$ is,
 A) Scalar function B) Vector function C) ϕ D) zero
- b. Find the value of the constant a such that the vector field,
 $\vec{F} = (axy - z^3)\mathbf{i} + (a - 2)x^2\mathbf{j} + (1 - a)xz^2\mathbf{k}$ is irrotational and hence find a scalar function ϕ such that $\vec{F} = \nabla \phi$. (04 Marks)
- c. Prove that $\text{curl}(\text{curl } \vec{A}) = \nabla(\nabla \cdot \vec{A}) - \nabla^2 \vec{A}$. (06 Marks)
- d. Express $\nabla^2 \psi$ in orthogonal curvilinear co-ordinates. (06 Marks)

PART – B

5 a. Choose the correct answers for the following : (04 Marks)

i) The value of $\int_0^{\frac{\pi}{4}} \cos^3(4x) dx$ is,

- A) $\frac{1}{3}$ B) $\frac{1}{6}$ C) $\frac{\pi}{3}$ D) $\frac{1}{2}$

ii) If the equation of the curve remains unchange after changing θ to $-\theta$ the curve $r = f(\theta)$ is symmetrical about,

- A) A line perpendicular to initial line through pole
 B) Radially symmetric about the point pole.
 C) Symmetry does not exist
 D) Initial line

iii) The volume of the curve $r = a(1 + \cos\theta)$ about the initial line is,

- A) $\frac{4\pi a^3}{3}$ B) $\frac{2\pi a^3}{3}$ C) $\frac{8\pi a^3}{3}$ D) $\frac{\pi a^3}{3}$

iv) The asymptote for the curve $x^3 + y^3 = 3axy$ is equal to,

- A) $x + y + a = 0$ B) $x - y - a = 0$ C) No Asymptote D) $x + y - a = 0$

b. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\log(1 + \sin x \cos x)}{\cos x} dx$. (04 Marks)

c. Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$. (06 Marks)

d. Find the area of surface of revolution about x-axis of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$. (06 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

i) In the homogeneous differential equation, $\frac{dy}{dx} = \frac{f_1(xy)}{f_2(xy)}$ the degree of the function,

$f_1(xy)$ and $f_2(xy)$ are,

- A) Different B) Relatively prime C) Same D) None of these

ii) The integrating factor of the differential equation, $\frac{dy}{dx} + \cot xy = \cos x$ is,

- A) $\cos x$ B) $\sin x$ C) $-\sin x$ D) $\cot x$

iii) Replacing $\frac{dy}{dx}$ by $\left(-\frac{dy}{dx}\right)$ in the differential equation $f\left(x, y, \frac{dy}{dx}\right) = 0$ we get the

differential equation of,

- A) Polar trajectory B) Orthogonal trajectory
 C) Parametric trajectory D) Parallel trajectory.

iv) Two families of curves are said to be orthogonal if every member of either family cuts each member of the other family at,

- A) Zero angle B) Right angle C) $\frac{\pi}{6}$ D) $\frac{2\pi}{3}$

b. Solve $(1 + e^{\frac{x}{y}})dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$. (04 Marks)

c. Solve $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. (06 Marks)

d. Find the orthogonal trajectories of $r^2 = a^2 \cos^2 \theta$. (06 Marks)

7 a. Choose the correct answers for the following :

i) $A = \begin{bmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{bmatrix}$ is called,

- A) Scalar matrix B) Diagonal matrix C) Identity matrix D) None of these
 ii) If $r = n$ and $x = y = z = 0$. The equations have only _____ solution.
 A) Non trivial B) Trivial C) Unique D) Infinite
 iii) In Gauss Jordan method, the coefficient matrix can be reduced to,
 A) Echelon form B) Unit matrix C) Triangular form D) Diagonal matrix
 iv) The inverse square matrix A is given by,

A) $|A|$ B) $\frac{\text{adj}A}{|A|}$ C) $\text{adj}A$ D) $\frac{|A|}{\text{adj}A}$

b. Find the Rank of the matrix, $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. (05 Marks)

c. Investigate the values of λ and μ such that the system of equations, $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ may be i) Unique solution ii) Infinite solution iii) No solution. (06 Marks)

d. Using Gauss elimination method solve, $2x_1 - x_2 + 3x_3 = 1$, $-3x_1 + 4x_2 - 5x_3 = 0$, $x_1 + 3x_2 - 6x_3 = 0$ (05 Marks)

8 a. Choose the correct answers for the following : (04 Marks)

i) A square matrix A of order 3 has 3 linearly independent eigen vectors then a matrix P can be found such that $P^{-1}AP$ is a,

- A) Diagonal matrix B) Unit matrix
 C) Singular matrix D) Symmetric matrix

ii) The eigen values of matrix $\begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 2 \end{bmatrix}$ are,

- A) $2 \pm \sqrt{6}$ B) $2 \pm \sqrt{2}$ C) $1 - \sqrt{6}$ D) None of these

iii) Solving the equations $x + 2y + 3z = 0$, $3x + 4y + 4z = 0$, $7x + 10y + 12z = 0$. x , y and z values are,

- A) $x = y = z = 0$ B) $x = y = z = 1$ C) $x \neq y \neq z \neq 1$ D) None of these

iv) The index and significance of the quadratic form, $x_1^2 + 2x_2^2 - 3x_3^2$ are respectively _____ and _____.

- A) Index = 1, Signature = 1 B) Index = 1, Signature = 2
 C) Index = 2, Signature = 1 D) None of these.

b. Find all the eigen values and the corresponding eigen vectors of the matrix,

$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (04 Marks)

c. Reduce the matrix $A = \begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$ into a diagonal matrix. (06 Marks)

d. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form.

(06 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2014

Engineering Physics

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only in OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.
 4. Physical constants : Velocity of light, $c = 3 \times 10^8$ m/s

Planck's constant, $h = 6.625 \times 10^{-34}$ J.S.

Charge on electron, $e = 1.602 \times 10^{-19}$ C

Mass of electron, $m = 9.1 \times 10^{-31}$ kg

Avagadro number, $N_A = 6.02 \times 10^{26}$ /k mole

Permittivity of vacuum, $\epsilon_0 = 8.85 \times 10^{-12}$ F/m

Boltzmann constant, $k = 1.38 \times 10^{-23}$ J/k.

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
- i) If an electron, proton, neutron and α - particle have the same velocity, the particle which has the largest wavelength is
 A) electron B) proton C) neutron D) α - particle
- ii) The Compton shift for the back scattered photon is
 A) $\frac{h}{m_0 e}$ B) $\frac{2h}{m_0 e}$ C) $\frac{h}{2m_0 e}$ D) $\frac{2h}{3m_0 c}$
- iii) The photoelectric effect is observed only if the wavelength of light is
 A) above threshold wavelength B) below threshold wavelength
 C) zero D) equal to threshold wavelength
- iv) The law which failed to account for longer wavelength of blackbody radiation spectrum is
 A) Wein's law B) Rayleigh-Jean's law
 C) Plank's law D) Maxwell's law
- b. Describe photoelectric effect along with Einstein's explanation. (06 Marks)
- c. Describe Davisson and Germer experiment for confirmation of de-Broglie hypothesis. (07 Marks)
- d. Calculate the kinetic energy of an electron of wavelength 18 nm [$h = 6.63 \times 10^{-34}$, $m_e = 9.11 \times 10^{-31}$ kg]. (03 Marks)

- 2 a. Choose the correct answers for the following : (04 Marks)

- i) From the Heisenberg's uncertainty relation, $\Delta L \cdot \Delta \theta \geq \frac{h}{4\pi}$, L refers to
 A) length B) linear displacement
 C) angular displacement D) angular momentum
- ii) The first excited state energy of a particle of mass m in a box of width 'a' is given by
 A) zero B) $\frac{h^2}{8ma^2}$ C) $\frac{2h^2}{8ma^2}$ D) $\frac{h^2}{2ma^2}$
- iii) Wave function associated with a material particle is
 A) single valued B) finite C) continuous D) all of these
- iv) If the uncertainty in momentum is large, the uncertainty in energy is
 A) small B) large C) zero D) independent

- b. Obtain the time independent Schrodinger wave equation for a particle in one-dimensional potential well of infinite height and discuss the eigen values. (09 Marks)
- c. What is Heisenberg's uncertainty principle? Discuss its significance. (03 Marks)
- d. An excited atom has an average life time of 10^{-8} seconds. During this period, it emits a photon and returns to the ground state. What is the minimum uncertainty in the frequency of this photon? (04 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- i) The Fermi temperature is given by
 A) $\frac{2}{3} \frac{E_F}{K}$ B) $\frac{3}{2} \frac{E_F}{K}$ C) $\frac{E_F}{K}$ D) $\frac{2E_F}{K}$
- ii) If the mobility of an electron in a metal increases, the resistivity
 A) decreases B) increases C) remains constant D) none of these
- iii) The Fermi energy of a metal at absolute zero temperature is proportional to (n - number of free electrons per unit volume).
 A) $n^{1/3}$ B) $n^{3/2}$ C) $n^{2/3}$ D) n^2
- iv) The electron energies in classical free electron theory follow
 A) Maxwell-Boltzmann statistics B) Fermi-Dirac statistics
 C) Bose-Einstein statistics D) none of these
- b. Explain the failures of classical free electron theory. (06 Marks)
- c. Explain Fermi-energy and Fermi-factor. Discuss the probability of occupation of various energy states by electron at $T=0^\circ\text{K}$ and $T > 0^\circ\text{K}$ on the basis of Fermi factor. (06 Marks)
- d. Calculate the mobility and relaxation time of electron in copper assuming that each atom contributes one free electron for conduction. Given resistivity of copper = 1.73×10^{-8} ohm-m. At. weight = 63.5, density = 8.92×10^3 kg/m³, $N_A = 6.02 \times 10^{26}$ /kg mole. (04 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) Copper is
 A) diamagnetic material B) paramagnetic material
 C) ferromagnetic material D) antiferromagnetic material
- ii) Electronic polarization
 A) increases with temperature B) decreases with temperature
 C) independent of temperature D) none of these
- iii) The unit of dipole moment per unit volume is
 A) coulomb/metre B) coulomb/metre²
 C) coulomb/metre³ D) coulomb
- iv) The electric susceptibility $\chi =$
 A) $\epsilon_0 EP$ B) $\frac{P}{\epsilon_0 E}$ C) $\frac{\epsilon_0 E}{P}$ D) $\frac{\epsilon_0 P}{E}$
- b. Describe the different polarization mechanism. (08 Marks)
- c. Explain hysteresis of ferroelectrics. (05 Marks)
- d. If a NaCl crystal is subjected to an electric field of 1 KV/m and the resulting polarization is 4.3×10^{-8} c/m². Calculate the dielectric constant of NaCl. [$\epsilon_0 = 8.85 \times 10^{-12}$ Fm⁻¹]. (03 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The life time of an atom on a metastable state is of the order
 A) a few seconds B) unlimited C) a nano second D) few millisecond

- ii) The ratio of Einstein's coefficients A and B is
 A) $\frac{8\pi h\lambda^3}{c^3}$ B) $\frac{8\pi h^2\lambda^3}{c^3}$ C) $\frac{8\pi h\gamma^3}{c^3}$ D) $\frac{8\pi h\gamma^3}{c^2}$
- iii) Holography records
 A) only amplitude B) only phase
 C) both amplitude and phase D) neither amplitude nor phase
- iv) Pumping process in a diode laser is by
 A) optical pumping B) forward bias C) electric discharge D) none of these
- b. Explain the construction and working of a He-Ne laser. (07 Marks)
- c. Explain the principle of holography and mention its applications. (05 Marks)
- d. Find the ratio of populations of two energy levels in a laser if the transition between them produces light of wavelength 6493 \AA , assuming the ambient temperature as 27°C . [$K = 1.38 \times 10^{-23} \text{ J/K}$]. (04 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) If the angle of incidence of a ray is equal to the critical angle at the interface of core and cladding, then the ray travels
 A) in the cladding B) in the core
 C) along the interface D) in the buffer
- ii) Fractional index change for the optical fibre of refractive index of core and cladding 1.68 and 1.56 is
 A) 0.0769 B) 0.0714 C) 1.0769 D) 0.9286
- iii) A type II superconductor in the vortex state show
 A) complete Meissner effect and zero electrical resistivity
 B) incomplete Meissner effect and zero electrical resistivity
 C) complete Meissner effect and non-zero electrical resistivity
 D) incomplete Meissner effect and non-zero electrical resistivity
- iv) Below the critical temperature, if the temperature of superconductor is increased, the critical field
 A) increases B) decreases C) remains constant D) independent
- b. What is attenuation? Explain the various mechanisms through which attenuation takes place. (07 Marks)
- c. Explain type-I and type-II superconductors. (05 Marks)
- d. The numerical aperture of an optical fibre is 0.2 when surrounded by air. Determine the RI of its core, given the RI of the cladding is 1.59. Also find the acceptance angle when the fibre is in water of RI 1.33. (04 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) A crystal of hexagonal lattice has unit cell with sides
 A) $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90^\circ$ B) $a = b = c, \alpha = \beta = \gamma = 90^\circ$
 C) $a \neq b = c, \alpha = \beta = 120^\circ, \gamma = 90^\circ$ D) $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$
- ii) A plane intercepts at $a, \frac{b}{2}, 2c$ in a simple cubic unit cell. The miller indices of the plane are
 A) (2 1 4) B) (2 4 1) C) (4 2 1) D) (1 2 4)
- iii) The coordination number in face centered cubic cell is
 A) 2 B) 6 C) 8 D) 12

- iv) In the Bragg's equation, $2d \sin \theta = n\lambda$, the angle θ is
 A) the angle between the incident beam and the diffracted X-ray beam.
 B) the angle between the incident beam and the normal to the diffraction planes
 C) the angle between the incident beam and the diffraction planes
 D) none of these.
- b. Define packing factor. Calculate the packing factor for sc, bcc and fcc structures. **(07 Marks)**
- c. Describe the construction and working of a Bragg's X-ray spectrometer. **(06 Marks)**
- d. Draw the following planes in a cubic unit cell:
 i) $(2\ 0\ 0)$ ii) $(\bar{2}\ 1\ 0)$ iii) $(1\ \bar{3}\ 2)$ **(03 Marks)**
- 8** a. Choose the correct answers for the following : **(04 Marks)**
- i) Carbon nanotubes are made up of
 A) graphene
 B) mica sheet layers
 C) honey comb
 D) plastic
- ii) The state of matter around the nano-size is known as
 A) solid state
 B) liquid state
 C) plasma state
 D) mesoscopic state
- iii) The elastic behaviour of a liquid is characterized by its
 A) Young's modulus
 B) Rigidity modulus
 C) Bulk modulus
 D) Poisson's ratio
- iv) Ultrasonic waves are produced by
 A) electromagnetic induction
 B) electric tuning fork
 C) piezo electric effect
 D) inverse piezo electric effect
- b. Write a note on fullerene. What are the applications of fullerenes. **(08 Marks)**
- c. Explain with principle, how the flaw in a solid can be detected by non-destructive method using ultrasonics. **(08 Marks)**

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First/Second Semester B.E. Degree Examination, June / July 2014
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, choosing at least two from each part.**
2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

- 1 a.** Choose the correct answers for the following : (04 Marks)
- i) Calomel electrode is reversible with respect to,
 A) Cl^- ion B) Ag^- ion C) Hg_2^{2+} ion D) None of these
- ii) A galvanic cell converts:
 A) Electrical energy in to chemical energy
 B) Chemical energy in to electrical energy
 C) Electrical energy in to heat energy
 D) None of these
- iii) The E° value of the cell $\text{Zn} / \text{Zn}^{2+} \parallel \text{Fe}^{2+} / \text{Fe}$ is if $E^\circ_{\text{Fe}^{2+}} = -0.44$ and $E^\circ_{\text{Zn}^{2+}} = -0.76$
 A) +0.32 V B) +1.2 V C) -0.32V D) -1.2V
- iv) Example of an ion selective electrode is,
 A) Calomel electrode B) Hydrogen electrode
 C) Platinum electrode D) Glass electrode
- b.** What is single electrode potential? Obtain an expression for the same. (05 Marks)
- c.** What are reference electrodes? Explain the construction and working of Calomel electrode. (05 Marks)
- d.** An electrochemical cell is constructed by immersing a silver wire in AgNO_3 solution of 0.5 M and a Cadmium wire in CdSO_4 solution of 0.25 M at 25°C . Write the cell diagram, cell reaction and calculate emf of the cell and change in free energy. Given $E^\circ_{\text{Ag}^+} = +0.80$ and $E^\circ_{\text{Cd}^{2+}} = -0.40$, $F = 96.5 \text{ KJ/kg/V}$ (06 Marks)
- 2 a.** Choose the correct answers for the following : (04 Marks)
- i) The density of H_2SO_4 to be maintained in the lead-acid storage cell is,
 A) 0.5 B) 1.2 C) 2.4 D) None of these
- ii) In which battery, a key component is separated from rest of the battery prior to activation.
 A) Primay B) Secondary C) Reserve D) None of these
- iii) The reaction taking place at anode of a battery,
 A) Reduction B) Addition C) Neutralization D) Oxidation
- iv) The electrolyte used in $\text{H}_2 - \text{O}_2$ fuel cell is,
 A) KOH B) NaCl C) NH_4OH D) KCl
- b.** Explain the following battery characteristics:
 i) Voltage ii) Energy storage density iii) Cycle life (06 Marks)
- c.** Explain the construction and working of Ni – Cd battery. (06 Marks)
- d.** Explain the construction and working of $\text{H}_2 - \text{O}_2$ fuel cell and mention its applications. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 3 a. Choose the correct answers for the following : (04 Marks)
- Development of non porous and uniform oxide film over a metal surface due to corrosion,
 - Decreases the corrosion rate
 - Increases the corrosion rate
 - Does not have any effect
 - None of these
 - Galvanizing is the process of coating of iron,
 - With Au
 - With Zn
 - With Cu
 - None of these
 - Which of the following is an example of cathodic coating,
 - Galvanizing
 - tinning
 - painting
 - None of these
 - Evolution of hydrogen type of corrosion occurs in,
 - Acidic medium
 - Basic medium
 - Both a and b
 - None of these
- b. What is metallic corrosion? Explain the electro chemical theory of corrosion. (05 Marks)
- c. Discuss the effect of the following factors on corrosion rate:
- Nature oxide film
 - Anodic to cathodic area
 - Polarization
- (06 Marks)
- d. Explain the following corrosion control methods:
- Use of inhibitor
 - Galvanisation
- (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- Technological importance of metal finishing is to impart,
 - Corrosion resistance
 - Solderability
 - Thermal resistance
 - All of these
 - Use of complexing agent during electrode deposition is to,
 - Obtain shining deposit
 - To check the metal ion concentration
 - Increase current density
 - None of these
 - The process used to manufacture P.C.B is,
 - Electroplating
 - Electrolessplating
 - Phosphating
 - None of these
 - Electroless plating process is possible only on,
 - Catalytically active surface
 - Inactive surface
 - Any surface
 - Only on plastic surface
- b. What is metal finishing? Mention any 3 technological importance of metal finishing. (04 Marks)
- c. Explain the factors that influence the nature of electrodeposit,
- pH of electrolytic bath;
 - temperature
 - current density
- (06 Marks)
- d. What is electroless plating? Explain the process of electroless plating of copper. (06 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Methyl tertiary butyl ether is added to gasoline to,
 - To increase the octane number
 - Minimize the knocking
 - To increase the efficiency of diesel
 - All of these
 - Which of the following posses zero octane number,
 - Iso Octane
 - α -Methyl naphthalene
 - n – heptane
 - Cyclohexane
 - Photovoltaic cell is a,
 - Storage cell
 - Rechargeable cell
 - Fuel cell
 - Energy conversion device
 - Knocking is due to,
 - Slow combustion
 - Incomplete combustion
 - Instantaneous explosive combustion
 - All of these
- b. What is calorific value of a fuel? Explain the bomb calorimeter method to determine calorific value of a solid fuel. (06 Marks)

- 5 c. Calculate the gross and net calorific value of a coal sample from the following data:
 i) Weight of coal – 0.73 g ii) Weight of water taken in calorimeter 1500 g iii) Water equivalent of calorimeter = 470 g iv) Rise in temperature 2.3°C v) Percentage of hydrogen in coal sample 2.5% vi) Latent heat of steam is 587 calg⁻¹. (05 Marks)
- d. Explain the methods of doping of silicon to get solar grade silicon. (05 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) Gibbs phase rule for general system:
 A) $P + I = C - 2$ B) $P + F = C - 1$ C) $P + F = C + 1$ D) $P + F = C + 2$
- ii) Which of the following is a one component system,
 A) Water system B) Lead – Silver system
 C) Iron – Carbon system D) None of these
- iii) Absorbance of light by a solution of a substance depends on,
 A) Path length B) Concentration of solution
 C) Wavelength of incident light D) All of these
- iv) Flame photometry is suitable for the detection of,
 A) Li B) Cu C) Fe D) Zn
- b. State phase rule. Discuss the application of phase rule to water system. (05 Marks)
- c. Explain the principle and application of potentiometric titration with respect to redox titration. (06 Marks)
- d. Discuss the conductometric titration and mention the advantages. (05 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) Which of the following is a copolymer?
 A) Polythene B) Nitrile rubber C) PVC D) Plexi glass
- ii) Requirement for conductivity in polymer is,
 A) Linear structure B) Presence of oxidising or reducing agents
 C) Conjugation D) All of these
- iii) Natural rubber is polymerized form of,
 A) Chloroprene B) Isoprene C) Propene D) None of these
- iv) Benzoyl peroxide is used as,
 A) Initiator B) Terminator C) Propagator D) None of these
- b. What is polymerization? Explain the addition polymerization's mechanism by taking polyethylene as example. (05 Marks)
- c. Explain the mechanism of conduction in polyacetylene. (05 Marks)
- d. Explain the manufacture of following polymers and mention the uses:
 i) Polymethyl methacrylate. ii) Neoprene. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) Alkalinity in water is not due to,
 A) H⁺ B) OH⁻ C) CO₃²⁻ D) HCO₃⁻
- ii) The titrant used in estimation of total hardness of water is,
 A) EDTA B) E.B.T C) NaCl D) KOH
- iii) The reagent used in the estimation of sulphate ion in water is,
 A) Phenoldisulfonic acid B) SPANDS
 C) Alumina D) Barium Chloride
- iv) Temporary hardness of water is due to,
 A) Ca(HCO₃)₂ B) CaCl₂ C) CaSO₄ D) MgSO₄
- b. What is desalination of water? Explain electro dialysis method. (05 Marks)
- c. Explain the experimental method of determination of total hardness of water. (06 Marks)
- d. 50 ml of sample of water consumed 15 ml of 0.01 M EDTA, before boiling and 5 ml of the same EDTA, after boiling. Calculate the total hardness, permanent hardness and temporary hardness. (05 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2014
Computer Concepts and C Programming

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only in OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

- 1** a. Choose the correct answers for the following : (04 Marks)
- A computer converts data into this _____.
 A) information B) charts C) software D) input or output
 - A device that holds a disk is called
 A) drive B) RAM C) ROM D) memory
 - The terms dots per inch (dpi) refers to
 A) printer resolution B) printer speed C) printer output D) printer size
 - The earliest computer were _____ systems.
 A) digital B) paper C) analog D) slide rule
- b. Differentiate between system software and application software. (06 Marks)
- c. Explain with example, different type of printers. (10 Marks)
- 2** a. Choose the correct answers for the following : (04 Marks)
- A list of command choices in an OS is called
 A) command line B) check box C) drop down list D) menu
 - _____ is one of the benefits using network.
 A) File security B) Peripheral sharing
 C) Protection from virus D) Folder creation
 - FTP sites are often called
 A) channels B) archives C) groups D) domain
 - DOS and Linux are examples of _____ interface.
 A) old fashion B) GUI C) command line D) parallel
- b. Explain in detail, various types of network topologies. (10 Marks)
- c. Define the following:
 i) Thrashing ii) Buffering iii) Spooling (06 Marks)
- 3** a. Choose the correct answers for the following : (04 Marks)
- Which of the following is a character constant?
 A) 'C' B) "c" C) "b" D) "?"
 - Which field specification is used to refer short int?
 A) %c B) %d C) %fd D) %hd
 - A nibble is _____.
 A) 4 bits B) 8 bits C) 16 bits D) 32 bits
 - Identify formatted console input function.
 A) getchar() B) gets() C) scanf() D) fgets()
- b. Explain the structure of a C program. (06 Marks)
- c. What are the different types of input and output functions? (10 Marks)

- 4 a. Choose the correct answers for the following : (04 Marks)
- A _____ is name given to the memory location where data can be stored, accessed or manipulated.
A) string B) keyword C) reserved word D) variable
 - The _____ data type does not occupy any space in the memory.
A) long int B) float C) void D) double
 - An operator which acts on 3 operands
A) Unary operator B) Key operator
C) Binary operator D) Ternary operator
 - What is the output of the following code?
main ()
{printf ("%d", 'A');}
A) 65 B) A C) 65.0 D) Error
- b. Evaluate the expressions where a = 8, b = 15, c = 4.
i) $2*((a\%5)*(4+(b-3)/(c-2)))$
ii) $100 / 20 <= 10 * 5 + 100 \% 10 - 20 == 5 >= 1! = 20$ (06 Marks)
- c. Write a C program to find and output all the roots of a quadratic equation for non zero coefficients. (10 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- The default return type of function is
A) int B) float C) char D) void
 - Which is the user defined function?
A) main() B) sqrt() C) clrscr() D) gets()
 - A function that calls itself is known as _____.
A) recursive function B) iterative function
C) main function D) none of these
 - Parameters passed as arguments to the function call are called as
A) actual parameters B) formal parameters
C) no parameters D) none of these
- b. Design and develop a function rightrot (x, n) in C that returns the value of the integer x rotated to the right by n bit positions as an unsigned integer. Invoke the function from the main with different values for x and n and print the results with suitable headings. (08 Marks)
- c. How are functions categorized based on the value returned by the function and parameter accepted? (08 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- Each case statement in switch is separated by
A) break B) continue C) exit D) goto
 - Several statements grouped together in braces is called
A) compound B) equivalent C) complex D) simple
 - In C language, "x?:y;z" is equivalent to
A) if (x == 0)y; else z; B) if (x == 1)z; else y;
C) if (x == 0)y; z; D) if (x == 1)y; else z;
 - How many times is the following loop executed
for (i = 0; i <= 5; i++)
{printf ("Hello");}
A) 1 B) 6 C) zero D) infinite
- b. Write a C program to find the sum of N natural numbers. (08 Marks)
- c. What is the purpose of a switch case statement? Explain with syntax. (08 Marks)

- 7 a. Choose the correct answers for the following : (04 Marks)
- The number of elements in array A[3][4] is
A) 8 B) 12 C) 16 D) none of these
 - If A[4] is declaration, then the first and last array index will be
A) 1, 4 B) 0, 3 C) 3, 0 D) none of these
 - A function that is used to string copy is
A) strcpy() B) strcpy() C) copystring() D) concat()
 - Given A[3][2] = {1, 2, 3, 4, 5, 6}; The element in 3rd row 2nd col is
A) 3 B) 4 C) 6 D) 2
- b. Explain initialization and declaration of 2D array. (08 Marks)
- c. Write a C program to input N integers in a single dimensional array and sort them in ascending order using Bubble sort. (08 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- _____ execution of an instruction in a computer system is referred as parallel computation.
A) Sequential B) Serial C) Accurate D) Simultaneous
 - Open MP stands for
A) open multi parallelism B) organized multi programming
C) open multi programming D) organized multi parallelism
 - An example of environment variable in open MP is
A) OMP_thread_limit B) OMP_init_lock
C) OMP_thread_ref D) OMP_get_byname
 - Which of the following can be used as resource in parallel computing?
A) Single computer with multi process B) Network of computers
C) Combination of above D) None of these
- b. What are threads? Give the advantages and disadvantages of multiple threads. (08 Marks)
- c. Design and develop a parallel program in C to determine and print prime numbers which are less than 100 making use of the algorithm of Sieve of Eratosthenes. (08 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2014

Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only in OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
- Geotechnical engineering involves the study of
 A) water B) soil C) oil D) all of these
 - A bascule bridge is a
 A) arch bridge B) floating bridge C) movable bridge D) none of these
 - Kerbs are the components of
 A) dam B) bridges C) roads D) buildings
 - Inspection gallery is a part of
 A) bridge B) dam C) harbour D) airport
- b. Briefly explain the scope of any three fields of civil engineering. (09 Marks)
- c. Explain different types of roads. (07 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- When trying to turn a key into lock, following is applied.
 A) coplanar forces B) moment C) lever D) couple
 - The vertical component of a horizontal force is
 A) zero B) one C) both A and B D) two
 - Two equal and opposite forces separated by a distance will produce.
 A) translation B) rotation C) both translation and rotation D) none of these
 - The resultant of two concurrent forces becomes maximum and minimum, if angle between them is
 A) 0° and 180° B) 0° and 90° C) 90° and 0° D) 0° and 0°
- b. Define force and state its characteristics. (06 Marks)
- c. Forces acting on the gusset plate of a joint in a bridge truss are shown in Fig.Q2(c). Determine the values of 'P' and ' θ ' to maintain the equilibrium of the joint.

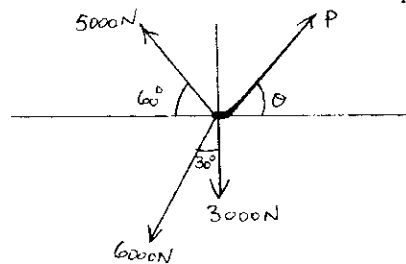


Fig.Q2(c)

(10 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- The process of finding the resultant of a system of forces is called
 A) resultant B) composition C) resolution D) none of these
 - If two concurrent forces each of 'P' act at right angles to each other, their resultant is
 A) 2P B) P C) $\sqrt{2} P$ D) $2\sqrt{P}$

- iii) Conditions of equilibrium for a coplanar concurrent force system is
 A) one B) two C) three D) four
- iv) If two forces are parallel, then they cannot be
 A) coplanar B) concurrent C) non coplanar D) non concurrent
- b. Two forces F_1 and F_2 act upon a body. If the magnitude of their resultant is equal to that of F_1 and direction perpendicular to F_1 , then find the magnitude and direction of force F_2 . Take $F_1 = 20$ N. (06 Marks)
- c. State Varignon's theorem of the moments. (03 Marks)
- d. Determine the forces P, F and T required to keep the frame in equilibrium.

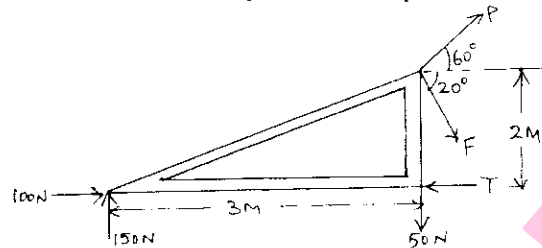


Fig.Q3(d)

(07 Marks)

- 4 a. Choose the correct answers for the following : (04 Marks)
- i) Centroid of a rectangle of base width 'b' and depth 'd' is
 A) $\frac{b}{3}$ and $\frac{d}{3}$ B) $\frac{b}{2}$ and $\frac{d}{2}$ C) $\frac{b}{4}$ and $\frac{d}{4}$ D) all of these
- ii) An axis over which one half of plane figure is just a mirror of the other half axis is
 A) bottom most axis B) axis of symmetry
 C) unsymmetrical axis D) top most axis
- iii) Centroid conveys some clue about
 A) the orientation of a surface B) center of a body
 C) shape and disposition D) area of cross section
- iv) The centroid of a semicircle of radius 'r' with respect to its base is
 A) $\frac{3r}{4\pi}$ B) $\frac{3r}{8\pi}$ C) $\frac{4r}{3\pi}$ D) $\frac{4r}{\pi}$
- b. Determine the centroid of a right angle triangle from first principles. (06 Marks)
- c. Find the centroid of the shaded area shown in Fig.Q4(c), obtained by cutting a semicircle of diameter 100 mm from the quadrant of a circle of radius 100 mm.

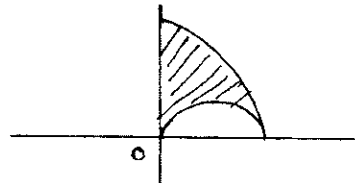


Fig.Q4(c)

(10 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The force equal and opposite to resultant is called as
 A) resultant B) equilibrant C) similar force D) all of these
- ii) Lami's equation can be applied when number of unknown forces are _____.
 A) five B) two C) three D) four
- iii) In a non concurrent force system, if $\sum H = 0$, $\sum V = 0$ then the resultant is
 A) zero B) horizontal C) vertical D) moment
- iv) A particle acted upon by two forces of equal magnitude is in equilibrium. The angle between the forces is
 A) 0° B) 90° C) 180° D) 45°

- b. State and prove Lami's theorem. (06 Marks)
- c. A 100 N sphere is resting in a trough as shown in Fig.Q5(c). Find the reactions at the contact points. Assume all contact surfaces are smooth.

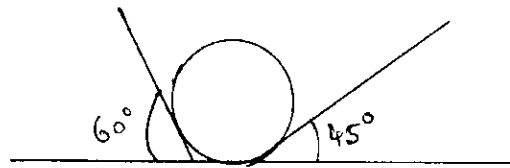


Fig.Q5(c)

(06 Marks)

- d. An electric lamp fixture weighing 10 N hangs from a point 'C' by strings AC at angle 60° and BC at angle 45° as shown in Fig.Q5(d). Determine the forces in strings. (04 Marks)

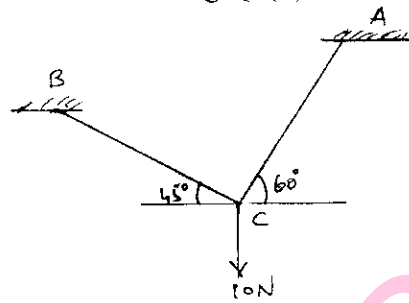


Fig.Q5(d)

- 6 a. Choose the correct answers for the following : (04 Marks)
- Support reactions for statically determinate beams can be determined by applying

A) Varignon's theorem	B) Lami's theorem
C) conditions of static equilibrium	D) none of these
 - When loads act constant rate over given length of beam, it is called as

A) point load	B) UDL	C) UVL	D) none of these
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 - A fixed support can have _____ reactions.

A) 1	B) 2	C) 3	D) 4
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 - The number of reactions components at a hinged end of a beam is

A) 0	B) 2	C) 3	D) 1
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- b. Find the reactions for a cantilever beam shown in Fig.Q6(b).

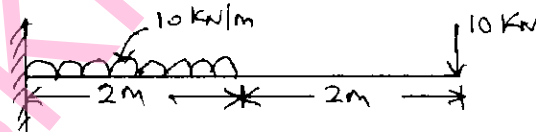


Fig.Q6(b)

(06 Marks)

- c. Determine the forces in all the members by the method of joints.

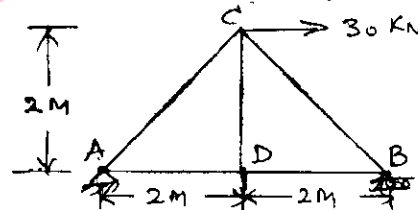


Fig.Q6(c)

(10 Marks)

- 7 a. Choose the correct answers for the following : (04 Marks)
- A friction force always acts _____ to the contact surface.

A) normal	B) parallel	C) at 45°	D) both A and C
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 - _____ friction is observed in the flow of liquids and gases.

A) fluid	B) static	C) sliding	D) kinetic
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- iii) Compared to static friction, kinetic friction is
 A) greater B) smaller C) very large D) zero
- iv) Angle of friction is _____ angle of repose.
 A) = B) > C) < D) both A and B
- b. A block weighing 800 N rests on an inclined plane at 12° to the horizontal. If the coefficient of friction is 0.4, find the force required to pull the body up the plane, when the line of the force is (i) parallel to the plane and (ii) horizontal. **(10 Marks)**
- c. Define: i) angle of friction, ii) coefficient of friction, iii) cone of friction. **(06 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**

- i) The unit of radius of gyration is
 A) mm B) mm^2 C) mm^3 D) mm^4
- ii) The moment of inertia of a triangle of base 'b' and height 'h' about its base is
 A) $\frac{bh^3}{36}$ B) $\frac{bh^4}{36}$ C) $\frac{b^3h}{12}$ D) $\frac{bh^3}{12}$
- iii) The moment of inertia of a square of side 'b' about its centroidal axis is
 A) $\frac{b^4}{12}$ B) $\frac{b^4}{8}$ C) $\frac{b^4}{36}$ D) $\frac{b^3}{12}$
- iv) The polar moment of inertia of a circular area of diameter 'd' is given by
 A) $\frac{\pi d^4}{24}$ B) $\frac{\pi d^4}{64}$ C) $\frac{\pi d^4}{32}$ D) $\frac{\pi d^4}{128}$

b. State and prove parallel axis theorem. **(06 Marks)**

c. Calculate the polar moment of inertia of the area shaded in Fig.Q8(c).

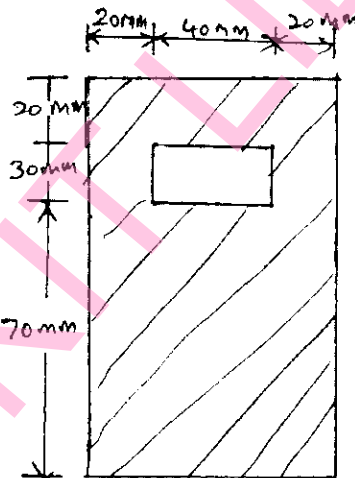


Fig.Q8(c)

(10 Marks)

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First/Second Semester B.E. Degree Examination, June / July 2014
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.
 4. Use of steam tables is not permitted.

PART – A

- 1** a. Choose the correct answers for the following : (04 Marks)
- i) The centrifugal forces generated by the earth rotation on the far side results in another bulge rise on this side of the earth.
 A) Lunar tides B) Earth quakes C) Volcanoes D) None of these
- ii) The condition of steam in the boiler is always,
 A) Dry B) Wet C) Saturated D) Superheated
- iii) Super heater is used,
 A) Inside the boiler drum B) To convert wet steam into dry steam
 C) In the path of the gases to increase volume of steam
 D) To increase temperature of steam above saturation temperature.
- iv) Babcock and Wilcox boiler is _____ boiler.
 A) Fire tube B) Water tube C) Air tube D) Fioxi tube
- b. With the help of a temperature – enthalpy diagram, explain the mechanism of its formation of steam. (10 Marks)
- c. Name any five boiler mounting and accessories and state their functions. (06 Marks)
- 2** a. Choose the correct answers for the following : (04 Marks)
- i) In reaction turbine, the pressure drops,
 A) In nozzles B) In moving blades
 C) In fixed blades D) In both fixed and moving blades.
- ii) Kaplan turbine is,
 A) A high head mixed flow turbine B) An impulse turbine, outward flow
 C) A reaction turbine, outward flow D) Low head, axial flow.
- iii) Delaval turbine is a _____,
 A) Impulse turbine B) Reaction turbine
 C) Velocity compounded turbine D) Pressure compounded turbine.
- iv) In a gas turbine, if the working substance is continuously recirculated, then it is called as,
 A) Open cycle gas turbine B) Closed cycle gas turbine
 C) Mixed flow gas turbine D) None of these
- b. Differentiate between open cycle and closed cycle gas turbine with neat sketches. (08 Marks)
- c. Sketch and explain the working of a Kaplan turbine. (08 Marks)
- 3** a. Choose the correct answers for the following : (04 Marks)
- i) In a 4 stroke CI engine during suction stroke,
 A) Only air is sucked B) Only diesel is sucked
 C) Both air and diesel are sucked D) Either air or diesel is sucked
- ii) The inner diameter of engine cylinder is called as,
 A) Stroke B) Clearanc C) Bore D) Pitch

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Q. NO. 3 (a) contd...

- iii) In a diesel engine the fuel is ignited by,
 A) Spark
 B) Ignitor
 C) Heat resulting from compressing air that is supplied for combustion
 D) Combustion
- iv) Piston speed is equal to,
 A) Stroke * rpm B) 2*stroke*rpm C) 48 stroke*rpm D) $\frac{(\text{stroke} * \text{rpm})}{2}$
- b. With the neat sketch, explain the working of 4 stroke diesel engine. **(08 Marks)**
- c. The following observations were obtained during a trial on a four stroke diesel engine:
 Cylinder diameter = 25 cm; Stroke of the piston = 40 cm
 Crank shaft speed = 250 rpm; Brake load = 70 kg
 Brake drum diameter = 2 m; Mean effective pressure = 6 bar
 Diesel oil consumption = 0.1 m³/min; CV = 43900 kJ/kg
 Specific gravity of diesel = 0.78
 Find : (i) BP (ii) IP (iii) FP (iv) η_{mech} **(08 Marks)**

- 4 a. Choose the correct answers for the following : **(04 Marks)**
- i) The boiling point of ammonia is,
 A) 100°C B) -33.3°C C) 33.3°C D) 0°C
- ii) Most commonly used refrigerant in vapour absorption refrigeration system is,
 A) Freon B) CO₂ C) SO₂ D) NH₃
- iii) Throttle valve is used in refrigerator to,
 A) Compress refrigerant B) Expand the refrigerant
 C) Absorb the heat from the refrigerant D) Condense the refrigerant
- iv) An ideal refrigerant should have,
 A) Low viscosity B) Low freezing point
 C) Low boiling point D) All of the above
- b. What are the desirable properties of refrigerant? **(06 Marks)**
- c. With a neat sketch, explain the construction and working of vapour absorption refrigeration system. **(10 Marks)**

PART – B

- 5 a. Choose the correct answers for the following : **(04 Marks)**
- i) The process of enlarging an already drilled hole is
 A) Spot facing B) Reaming C) Tapping D) Boring
- ii) _____ is the process of generating internal threads
 A) Tapping B) Turning C) Knurling D) None of these
- iii) The slowest speed in Lathe is adopted for the following operation :
 A) Turning B) Thread cutting C) Tapper turning D) Knurling
- iv) Twist drills are usually made of
 A) HSS B) Diamond C) Carbides D) MS
- b. List the four elements which specify the size of the Lathe. **(06 Marks)**
- c. Explain the difference between facing and turning operations. **(04 Marks)**
- d. Draw the neat sketch of radial drilling machine and label all its parts. **(06 Marks)**

- 6 a. Choose the correct answers for the following : (04 Marks)
- The cutting tool in a milling machine is mounted on ____
A) Tool holder B) Arbor C) Column D) Table
 - ____ is the one of the abrasive material used in grinding machine.
A) Aluminum chloride B) Calcium chloride
C) Silicon carbide D) Tungsten carbide
 - The thickness of chip is maximum at the beginning of the cut and minimum at the end of the cut, cut in each case of
A) Up milling B) Down milling C) Straddle milling D) None of these
 - One of the milling operation used to produce dovetail groove is
A) Slot milling B) Straddle milling
C) End milling D) Angular milling
- b. Differentiate between Up milling and Down milling. (04 Marks)
- c. With a neat diagram, explain the working of a vertical milling machine. (06 Marks)
- d. With suitable sketches, explain the operation of centreless grinding machine. (06 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- The hard filler material used in brazing ____
A) Solder B) Flux C) Spelter D) Electrode
 - Support provided for rotating shaft is ____
A) Bearing B) Lubricant C) Axle D) Hook
 - Carburizing flame has ____
A) One Zone B) Two Zone C) Three Zone D) No Zone
 - In arc welding the electrode which melt along with the work pieces and fill the Joint is called as
A) Consumable electrode B) Non consumable electrode
C) Both (a) and (b) D) None of these
- b. Sketch and explain electric arc welding process. (06 Marks)
- c. With a neat sketch, explain the different types of flames used in gas welding and specify their application. (04 Marks)
- d. Explain with a neat sketch, the method of splash lubrication. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- For converting rotary motion into rectilinear motion type of gear used is
A) Spur gear B) Rack and pinion C) Spiral gear D) Bevel gear
 - The ratio of diameter of driver and driven pulley is called
A) module B) Pitch circle diameter
C) Ratio of tension D) Velocity ratio.
 - The gear used to connect perpendicular axle shaft is
A) Helical gear B) Spur gear C) Bevel gear D) Worm gear
 - The ratio of pitch circle diameter to number of teeth is
A) Pitch B) Circular pitch C) Module D) Addendum
- b. List five advantages of gear drives over belt drives. (05 Marks)
- c. Define slip and creep with respect to belt drives. (05 Marks)
- d. Write the different types of gear trains with their applications. (06 Marks)

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First/Second Semester B.E. Degree Examination, June / July 2014
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

- Note:**
1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1. a. Choose the correct answers for the following : (04 Marks)
 - i) The resistance of a conductor is directly proportional to its _____ and inversely proportional to its _____.
 A) Length & Area B) Area & Length
 C) Length & Current D) Length & Voltage
 - ii) When the conductor moves perpendicular to the lines of flux, the emf induced is _____
 A) Minimum B) Maximum C) Zero D) None of these
 - iii) The mutual inductance between two coils of self inductance 0.8 H and 0.2 H, have a co-efficient of coupling 0.9 is _____,
 A) 0.36 H B) 0.4 H C) 0.16 H D) 0.144 H
 - iv) An electric heater is rated to 2 kW, 200 V. The resistance of the heater coil is _____,
 A) 10 Ω B) 0.1 Ω C) 20 Ω D) 200 Ω
 - b. Show that the equivalent resistance of two resistors connected in parallel in the ratio of the product of these two resistances divided by the sum of those two resistance values. (04 Marks)
 - c. Derive an expression for dynamically induced emf. (06 Marks)
 - d. Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that 60% of the flux produced by one coil. If a current of 10 A, flowing in the first coil, produces a flux of 0.5 mwb. Find the inductance of the second coil. (06 Marks)
2. a. Choose the correct answers for the following : (04 Marks)
 - i) An alternating current is given by $i = 14.14 \sin\left(\omega t + \frac{\pi}{6}\right)$ has an rms value of _____ amperes.
 A) 10 A B) 14.14 C) 20 A D) 0.707
 - ii) In an a.c circuit, the ratio of kW/KVA represents _____.
 A) Power factor B) Load factor C) Form factor D) Peak factor
 - iii) A current drawn by a capacitor of 20 μF is 1.382 A from a 220 V A.C. supply. The supply frequency is _____,
 A) 25 Hz B) 60 Hz C) 50 Hz D) 40 Hz
 - iv) The unit of apparent power is _____,
 A) kW B) KVAR C) KVA D) Joules
 - b. Define: (i) Instantaneous value (ii) Amplitude (iii) Cycle (iv) Period with respect to sinusoidally varying quantities. (04 Marks)
 - c. Two impedances $(150 - j157) \Omega$ and $(100 + j110) \Omega$ are connected in parallel across 200 V, 50 Hz supply. Find branch currents, total current and total power consumed in the circuit. Draw the phasor diagram. (06 Marks)
 - d. Show that the power consumed in an R-C series circuit is $Vl\cos\phi$. Draw the waveform for voltage, current and power. (06 Marks)

 Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 – 50, will be treated as malpractice.

- 3 a. Choose the correct answers for the following : (04 Marks)
- The phase sequence of a three phase system is RYB. The other possible phase sequence is _____.
A) YRB B) BRY C) RBY D) None of these
 - When the two wattmeters used to measure three phase power gives equal readings, then the p.f of the circuit is given by _____.
A) 0 B) 0.5 C) 1 D) 0.866
 - The power consumed by a 3- ϕ load is given by the expression _____.
A) $3V_L I_L \cos\phi$ B) $V_L I_L \cos\phi$ C) $\sqrt{3} V_L I_L \cos\phi$ D) $\sqrt{3} V_L \cos\phi$
 - A 3- ϕ apparatus is _____ efficient than a 1 - ϕ apparatus.
A) More B) Less C) Both (A) & (B) D) None of these
- b. What are the advantages of 3- ϕ systems over a single phase system? (06 Marks)
- c. A 3 - ϕ . 400 V. motor takes an input of 40 kW at 0.45 p.f. lag. Find the reading of each of the two single phase wattmeters connected to measure the input. (05 Marks)
- d. Obtain the relationship between line current and phase current in a balanced 3- ϕ delta connected system. (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- The totating disc of the energy meter is made of _____.
A) Copper B) Silver C) Aluminum D) Platinum
 - One unit of electrical energy is equivalent to _____.
A) 3.6 kW.s B) 3600 W.S C) 1 kWh D) 10 Wh
 - An intermediate switch is used in _____ of lamps.
A) Three way control B) Two way control
C) One way control D) Four way control
 - The value of "Fusing Factor" is always _____.
A) Less than 1 B) Equal to 1 C) Zero D) More than 1.
- b. With the help of neat diagram, explain the construction and principle of operation of a single phase induction type energy meter. (08 Marks)
- c. Write the circuit diagram and switching table for two-way and three-way control of lamp. Where is it used? (08 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- The purpose of commutator in a d.c. generator is to _____.
A) Increase output voltage B) Convert emf from AC to DC
C) Reduce sparking at brushes D) Increase the speed
 - In a lap winding, the number of parallel paths is equal to _____.
A) $\frac{P}{2}$ B) 2P C) P D) 4P
 - The speed of a d.c _____ motor is almost constant.
A) Shunt B) Series C) Compound D) None of these
 - The torque produced by DC motor is directly proportional to _____.
A) $V I_a$ B) $I_a R_a$ C) ϕI_a D) $E_b I_a$
- b. Derive the expression for the e.m.f of a DC generator. (04 Marks)
- c. Sketch the various characteristics of DC shunt motor and mention its applications. (06 Marks)
- d. A DC shunt motor takes an armature current of 110 A at 480 V. The armature resistance is 0.2 Ω . The machine has 6 poles and armature is lap connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate i) speed ii) the torque developed by the armature. (06 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The transformation ratio in a transformer is equal to _____.
 A) $\frac{E_1}{E_2}$ B) $\frac{N_1}{N_2}$ C) $\frac{N_2}{N_1}$ D) $\frac{I_2}{I_1}$
 - The efficiency of a transformer is maximum when _____.
 A) Iron loss is more than copper loss B) Iron loss is equal to copper loss
 C) Iron loss is less than copper loss D) None of these
 - Core type of transformers are used to handle _____ and _____ voltages.
 A) Low and High B) Low and Medium C) High and Medium D) None of these
 - Copper loss in a transformer is a _____ loss.
 A) Constant loss B) Variable loss C) Friction loss D) None of these
- b. Explain the construction and working of a transformer. (06 Marks)
- c. Find the number of turns on the primary and secondary side of a 440/230 V, 50 Hz single phase transformer, if the net area of cross section of the core is 30 cm² and the maximum flux density is 1Wb/m². (04 Marks)
- d. A single phase transformer working at 0.8 pf has an efficiency 94% at both three fourth full load and full load of 600 kW. Determine the efficiency at half full –load, unity power factor. (06 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- A non salient pole rotor is used in _____ alternator.
 A) Low speed B) High speed C) Medium speed D) A and B
 - The speed at which a 4–pole alternator has to be driven to generate a voltage at 50 Hz is _____.
 A) 1000 rpm B) 1500 rpm C) 2000 rpm D) 1440 rpm
 - The E. M. F. induced in an alternator is given by the equation _____.
 A) $4.44 f \phi z k_p k_d$ B) $2.22 k_p f \phi z$ C) $2.22 f \phi z k_p k_d$ D) $4.44 f \phi z$
 - The field winding of an alternator is _____ excited.
 A) DC B) AC C) Both DC and AC D) None of these
- b. How are alternators classified? With a neat diagram, show the difference between them. (08 Marks)
- c. A 2 – pole, 3 – phase alternator running at 3000 rpm has armature slots with 2 conductors in each slot. Calculate the flux per pole required to generate a line voltage of 2300 V. Distribution factor is 0.952 and pitch factor is 0.956. (06 Marks)
- d. Define regulation of an alternator. (02 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The frequency of the rotor current is _____.
 A) $\frac{s}{f}$ B) sf C) sf^2 D) None of these
 - In a 3 – phase induction motor, the slip speed is given by _____.
 A) N_s B) N C) $N_s - N$ D) $N - N_s$
 - The synchronous speed of three phase induction motor is given by _____.
 A) $N_s = \frac{120f}{P}$ B) $N_s = 120 fP$ C) $\frac{120P}{f} = N_s$ D) $N_s = \frac{Pf}{120}$
 - A 3– ϕ induction motor having 4 – poles, 50 Hz runs at 1440 rpm, the slip is _____.
 A) 3% B) 5% C) 4% D) 1%
- b. With a neat diagram, explain the working principle of 3 - ϕ induction motor. (06 Marks)
- c. A 10 pole induction motor is supplied by a 6 – pole alternator which is driven at 1200 rpm. If the motor runs with a slip of 3%, what is its speed? (06 Marks)
- d. Why does an induction motor need a starter? (04 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2014

Basic Electronics

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only in OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

- 1 a.** Choose the correct answers for the following : (04 Marks)
- Zener diode can be used for rectification. This statement is _____.
 A) true B) false
 C) neither true nor false D) none of these
 - The maximum efficiency of full wave rectifier is _____.
 A) 40.6% B) 60.4% C) 78.5% D) 81.2%
 - The knee voltage of a silicon diode is _____.
 A) 0.3V B) 0.5V C) 0.7V D) none of these
 - If f Hz is the frequency of the input given to a half wave rectifier, the output frequency will be _____.
 A) $2f$ Hz B) f Hz C) $3f$ Hz D) $0.5f$ Hz
- b.** Draw and explain the VI – characteristics of a Si-diode and Ge-diode. (06 Marks)
- c.** With a neat circuit diagram, explain the working principles of full wave bridge rectifier and show that the ripple factor = 0.48, and efficiency = 81.2%. (10 Marks)
- 2 a.** Choose the correct answers for the following : (04 Marks)
- The current conduction in BJT is because of _____.
 A) electrons B) holes
 C) both electrons and holes D) none of these
 - If $\alpha = 0.95$, then the value of β of transistor is _____.
 A) 0.05 B) 19 C) 100 D) 120
 - Common collector arrangement is generally used for _____.
 A) impedance matching B) voltage amplification
 C) current amplifier D) none of these
 - The current relationship between two current gain in a transistor is _____.
 A) $\beta = \frac{\alpha}{1-\alpha}$ B) $\beta = \frac{1+\alpha}{1-\alpha}$ C) $\beta = \frac{1-\alpha}{1+\alpha}$ D) $\beta = \frac{1+\beta}{\beta}$
- b.** Draw input and output characteristics of an NPN transistor in common base configuration and explain. (10 Marks)
- c.** For a Silicon transistor $\alpha_{dc} = 0.995$, emitter current is 10 mA and leakage current I_{c0} is $0.5\mu A$. Find I_C , I_B , β and I_{CEO} . (06 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- Which of the following factor affects the Q-point stability?
A) I_{CO} B) coupling capacitor
C) emitter resistor D) bypass capacitor
 - The inter section of the dc load line with given base current curve is the
A) h-point B) D-point C) Q-point D) none of these
 - For an emitter follower, the voltage gain is _____.
A) unity B) greater than unity C) less than unity D) zero
 - The best biasing stability is achieved by using _____ biasing method.
A) fixed B) collector to base C) voltage divider D) none of these
- b. Explain the working of collector-to-base bias circuit using an NPN transistor and derive the equation for I_B . (08 Marks)
- c. Define stability factor and discuss the factors that cause instability of biasing circuits. (08 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- FET is a _____ controlled device.
A) voltage B) current C) pulse D) power
 - PNPN device is an _____.
A) UJT B) SCR C) MOSFET D) MODFET
 - _____ used as a relaxation oscillator.
A) MOSFET B) SCR C) BJT D) UJT
 - The intrinsic standoff ratio of UJT _____.
A) equal to one B) must be less than unity
C) must be greater than unity D) must be zero
- b. Explain the working of two transistor model of an SCR and obtain the expression for the anode current. (08 Marks)
- c. Draw the equivalent circuit and VI-characteristic of UJT and explain it. (08 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Oscillator uses _____ type of feedback.
A) positive B) negative C) reverse D) both A and B
 - The frequency of oscillations in an oscillator is given by _____.
A) $\frac{1}{2\pi LC}$ B) $2\pi LC$ C) $2\pi\sqrt{LC}$ D) $\frac{1}{2\pi\sqrt{LC}}$
 - With negative feedback, the bandwidth of an amplifier _____.
A) decreases B) increases C) both A and B D) constant
 - The magnitude voltage gain at half power frequencies of an RC coupled amplifier is _____ times maximum voltage gain.
A) 0.707 B) 7.07 C) 10 D) 17.06
- b. Draw the frequency response of an RC-coupled amplifier and explain it. Mention its advantages and disadvantages. (08 Marks)
- c. Explain with the help of circuit diagram the working of an RC phase shift oscillator using transistor. (06 Marks)
- d. In a transistor colpitts oscillator having tank circuit parameters as $c_1 = 0.001 \mu\text{F}$ and $c_2 = 0.01 \mu\text{F}$ if $L = 5\mu\text{H}$, calculate the frequency of oscillations. (02 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The gain of the voltage follower is _____.
A) zero B) infinite C) negative D) unity
 - Ideally open loop gain of op-amp is _____.
A) 0 B) 1 C) ∞ D) positive
 - The CMRR is given by _____.
A) $A_d \times A_c$ B) A_c/A_d C) A_d/A_c D) none of these
 - Maximum rate of change of output voltage with time is called _____.
A) CMRR B) slew rate C) over rate D) none of these
- b. List the characteristics of an ideal-op-amp and draw the three input inverting summer circuit using an op-amp and derive an expression for output voltage. (08 Marks)
- c. Draw the basic block diagram of a cathode ray tube and explain its working. (08 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- Two's complement of $(1001)_2$ is _____.
A) 1001 B) 0010 C) 0111 D) 1010
 - To represent 35 in binary, number of bits required is _____.
A) 6 B) 5 C) 4 D) 33
 - Decimal number 37 is represented in BCD by _____.
A) 100111 B) 00111011 C) 00110111 D) 111100
 - Over modulation exists when modulation index is _____.
A) 1 B) 0 C) >1 D) <1
- b. Explain the need for modulation. (06 Marks)
- c. Convert $(A3B)_{16} = (\quad)_{10}$, and $(247.75)_{10} = (\quad)_2$. (04 Marks)
- d. i) Perform $(FC02A)_{16} - (D052)_{16}$ using 16's complement.
ii) Subtract $(4317.64)_8$ from $(42.345)_8$ using 8's complement. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The expression for half adder carry with input A and B is given by _____.
A) $A + B$ B) AB C) $\overline{A} \overline{B}$ D) none of these
 - The complement of $A + B + 1$ is _____.
A) 0 B) $A + 1$ C) $AB + 1$ D) 1
 - $ABCD + ABD$ is equal to _____.
A) ABC B) ABC C) \overline{ABD} D) ABD
 - $A + (B + C) = (A + B) + C$ is _____ law.
A) associative B) commutative C) distributive D) none of these
- b. Design a full adder circuit and realize, using two half adders. (08 Marks)
- c. Simplify the following expressions and implement using only NAND gates : (08 Marks)
- $Y = \overline{ABC} + \overline{A}BC + A\overline{B}C + \overline{A}BC$
 - $Y = \overline{AB} + \overline{AC}$
 - $Y = A + \overline{AB}$.

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Question Paper Version : C

I / II Semester B.E Degree Examination, June/July 2014
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. There is no provision for impeachment of
 - a) Judges of Supreme court and high court
 - b) Vice President
 - c) President
 - d) Governor
2. Who is the President of India
 - a) Mrs. Pratibha Patil
 - b) Mr. Pranab Mukharjee
 - c) Dr. A.P.J Abdul Kalam
 - d) Mr. S.M. Krishna
3. Fear isresponsibility
 - a) a way to shift
 - b) an impediment
 - c) Both a and b
 - d) a way to corrupt
4. If one considers engineering profession as a building, then the following is its foundation
 - a) accepting the risk
 - b) imagination
 - c) Honesty
 - d) Creativity
5. A fault tree is used to :
 - a) To improve safety
 - b) To claim compensation
 - c) Assess the risk involved
 - d) Take free consent
6. A person arrested has to be produced before the magistrate
 - a) 24 hours
 - b) 48 hours
 - c) 72 hours
 - d) 96 hours
7. The owner of the patent right retains it for
 - a) 100 years
 - b) 20 years
 - c) 50 years
 - d) 75 years
8. This is not the dishonesty in Engineering
 - a) Forging
 - b) Trimming
 - c) Blending
 - d) Cooking
9. The constitution empowers State Government to make special law for
 - a) unemployed youth
 - b) formen
 - c) workers
 - d) women and children

10. Which state among the following has two houses
a) Tamilnadu b) Andhra Pradesh c) West Bengal d) Karnataka
11. The total number of ministers in the council of ministers of the Union shall not exceed
a) 21 % of the total members of Lok sabha
b) 12 % of the total members of Lok sabha
c) 15 % of the total members of Lok sabha
d) 15 % of the total members of both Lok sabha and Rajya sabha
12. Right against exploitation seeks to protect the weaker sections of the society by
a) giving equal pay for equal work for both men and women
b) proving compulsory education for children below the age of 14 years
c) prohibiting human trafficking and Begar
d) None of these
13. One third of the members of Rajya Sabha retire
a) every year b) every two years c) every three years d) every four years
14. The directive principles of the state policy do not direct the state to endeavour to protect
a) Environment
b) the objects of artistic interest of National importance
c) Forest d) the interest of minorities
15. The Chief Justice and other Judges of the State High Court hold office until they attain the age of
a) 58 years b) 60 years c) 65 years d) 62 years
16. Passing criminal law with retrospective effect is called as
a) Expost facto laws b) post facto laws
c) Post Export laws d) None of these
17. Which of the following writ is issued by the court in case of illegal detention of a person
a) Certiorari b) Mandamus c) Habeas corpus d) Quo - warrants
18. The sole channel of communication between President and his council of ministers is
a) Speaker of Lok Sabha b) Prime Minister
c) Vice President d) Opposition leader
19. Article 19 provides
a) Seven freedoms b) Five freedoms c) Two freedoms d) Six freedoms
20. 'Respite' means
a) Awarding lesser punishment in place of originally awarded
b) Temporary suspension of death sentence
c) Reducing the length of the punishment without changing the character of the punishment
d) substituting one form of punishment for another of a lighter character.
21. Directive principles come under ___ of the constitution
a) Part - II b) Part - III c) Part - IV d) Part I
22. The ground for the impeachment of the President
a) Failure to follow the advice given by the Prime Minister
b) Unable to discharge his duties due to old age
c) Violation of constitution
d) Misbehaviour with Foreign dignitaries.

23. The speaker of Lok sabha is
 a) Appointed by the President b) Elected by members of parliament
 c) Appointed by the vice President d) Elected by the members of Lok sabha
24. The Number of members nominated by the President to Rajya Sabha is
 a) 12 b) 10 c) 14 d) 8
25. Revealing confidential information amounts to
 a) violation of patent b) misuse of truth
 c) breach of contract d) criminal breach of trust.
26. Financial emergency can be proclaimed under the article
 a) 256 b) 356 c) 360 d) 352
27. According to Indian constitution, the power of amending the constitution are vested with
 a) Parliament of India b) President of India
 c) People of India d) The Prime Minister of India
28. In the Indian constitution, the fundamental rights
 a) were added by the first amendment b) formed part of the original constitution
 c) were added by the 42nd amendment d) were added by the 24th amendment
29. The Chief Election Commissioner is appointed by the
 a) Chief Justice b) President c) Prime Minister d) Governor
30. To declare National Emergency a decision must be taken by the
 a) Rajya Sabha b) Lok Sabha c) Union Cabinet
 d) Both by the Lok Sabha and Rajya Sabha.
31. Legislature council is
 a) dissolved after 6 years b) after 3 years
 c) after 5 years d) not dissolved
32. What is the minimum age for becoming MP at Lok sabha and Rajya sabha
 a) 25 and 18 b) 25 and 30 c) 18 and 25 d) 30 and 25
33. Lying is
 a) dishonesty b) one of the ways of misusing the truth
 c) cheating d) None of these
34. One of the salient features of our constitution is
 a) It is partly rigid partly flexible b) It is fully flexible
 c) Fully rigid d) None of these
35. Right to religion is not subject to
 a) public order b) public morality c) public welfare d) public health
36. Which amendment deals with establishment of municipalities as a part of constitutional system
 a) 74th b) 76th c) 86th d) 44th
37. To become a judge of the High Court, one must be practicing advocate of High court for a period of at least _____ years
 a) 20 b) 10 c) 15 d) 5

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Question Paper Version : A

First/Second Semester B.E Degree Examination, June/July 2014

Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. Anthropogenic activities means.

a) Natural made	b) Biological	c) Manmade	d) Animal made
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2. Which of the following energy source is less eco-friendly?

a) Wind	b) Water	c) Solar	d) Thermal
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3. Which of the following is a biotic component of an ecosystem?

a) Sunlight	b) Fungi	c) Temperature	d) Water
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4. Generation of wind energy is mainly based on which factor

a) Direction of wind	b) Storms	c) Velocity of wind	d) Wind pressure
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5. Example for abiotic component of eco-system

a) Plants	b) Food	c) Water	d) Live stock
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6. Amount of carbon dioxide present in atmospheric air is

a) 21%	b) 0.383%	c) 78%	d) 0.318%
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7. Estuary means

a) Rich in nutrients	b) End point of the river
c) Meeting place of river and sea	d) Treatment of water
8. Physical pollution of water is due to

a) Chlorides	b) Turbidity	c) PH	d) All of these
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9. Control of water Borne diseases can be achieved effectively in a community by
a) Defluoridation b) Disinfection c) Sterilization d) Vaccination
10. Ozone layer thickness is measured in which units
a) PPM b) PPB c) Db d) DU
11. Eutrophication means
a) Quality of water in lakes b) Enrichment of plant nutrients in water
c) Water purification technique d) Meeting point of river and sea.
12. Earth's body temperature is approximately equal to ____?
a) 16.4°C b) 16.6°C c) 36°C d) 21.6°C.
13. Presence of BOD in drinking water indicates
a) Rich content of oxygen b) Organic matter
c) Turbidity d) Physical impurities
14. Which of the following is a natural source of Air pollution?
a) Acid rain b) Precipitation c) Storms d) Volcanic eruption
15. Effect of carbon monoxide on blood, causing
a) H_2CO_3 b) COHb c) CO_2Hb d) $HbCO_2$
16. Demography means
a) Study on forest b) Study on Human activities
c) Study on earthquake d) Study on population growth
17. Freon's are called
a) Hydrocarbons b) Ozone c) Methane d) Solvents
18. Which of the following is a biodegradable pollutant?
a) DDT b) Sewage c) CFC d) Freon's
19. Percentage of ground water available on Earth's environment is
a) 0.02 b) 0.5 c) 1.5 d) 0.2
20. During green house effect, carbondioxide and water vapours absorbs.
a) Short wave radiations b) Long wave radiations
c) Solar radiation d) UV radiations
21. Ozone is present in which layer of the atmosphere
a) Ozonosphere b) Stratosphere c) Troposphere d) Ionosphere
22. What is the maximum allowable concentration of fluorides in drinking water?
a) 1.0 mg/l b) 1.25 mg/l c) 1.50 mg/l d) 1.60 mg/l
23. Which of the following gas is not concern to green house effect?
a) CO_2 b) CH_4 c) SO_2 d) H_2O vapour

24. Which of the following is not a renewable source of energy?
a) Solar b) Wind c) Nuclear d) Geo-Thermal
25. Optimum growth of bacteria in favorable PH value of
a) 6.5 – 8.5 b) 7.0 c) 6.5 – 7.5 d) 7.0 – 14.0
26. Bhopal gas tragedy was caused due to leakage of _____
a) CH₄ b) MIC c) SO₂ d) Pesticides
27. Karnataka state pollution control board was established in the year
a) 1984 b) 1976 c) 1974 d) 1983
28. Among all oxides of nitrogen which one is responsible for the formation of acid rain
a) Nitrous oxide b) Nitric oxide
c) Nitrogen Trioxide d) Nitrogen pentoxide
29. The liquid waste generated from municipal solid waste disposal pits is called
a) Solid waste water b) Sewage
c) Leachate d) Compost waste water
30. Minimum allowable limit of noise pollution for Human persistence is _____
a) 40dB b) 90dB c) 45dB d) 55dB
31. HIV can be transmitted to humans through which media?
a) Air b) Blood c) Virus d) Hereditary
32. Mineral resources are
a) Renewable b) Fossil fuels c) Non-renewable d) Sedimentary rocks
33. World Ozone day is being celebrating on every year
a) 15th Sept. b) 16th Oct. c) 16th Sept. d) 22nd April
34. Contribution of carbon dioxide to global warming from industries
a) 50% b) 24% c) 25% d) 75%
35. Which atmospheric layer is closest to the Earth's surface?
a) Mesosphere b) Troposphere c) Stratosphere d) Thermosphere
36. Example for tertiary consumers
a) Plants b) Cattle c) Snake d) Elephant
37. As per BIS, the minimum allowable limit of iron content in drinking water is _____
a) 1.0 mg/l b) 0.2 mg/l c) 0.3 mg/l d) 0.5 mg/l
38. In Hydro-power plants, power is generated by _____
a) Solar b) Thermal c) Water d) Coal
39. The PH value of acid rain was recorded in early days
a) 2.5 b) 7.5 c) 4.7 d) 5.7

40. First international earth summit was held at
a) USA b) Russia c) Rio de-Janeiro d) Johannesburg
41. The air prevention and control of pollution Act was enacted in the year ____
a) 1987 b) 1974 c) 1981 d) 1986
42. Smog is formed by the reaction of which air pollutants
a) Smoke and Mist. b) Smoke and Fog c) Smoke and Bio-Gas d) Smoke and Dust
43. Which of the following is not a solution for Global Warming?
a) Reducing use of Fossil fuels b) Planting more trees
c) Deforestation d) Reducing vehicular transportation
44. Methemoglobinemia is caused by the contamination of water due to ____
a) Mercury b) Nitrate c) Arsenic d) Nitrates
45. Earth's Day is celebrated on every year
a) June 22nd b) Sept.22nd c) April 22nd d) June 5th
46. Expansion of the term WWF is ____
a) World wide life force b) World wide forest
c) World wide life forest d) World wild life fund
47. Maximum allowable concentration of total hardness as per BIS in drinking water ____
a) 600 mg/l b) 300 mg/l c) 1000 mg/l d) 250 mg/l
48. Water pollution prevention and control Act was enacted in the year ____
a) 1986 b) 1974 c) 1981 d) 1987
49. Stone cancer is an effect of ____
a) Climatic change b) Hard water c) Acid rain d) Excess of calcium
50. Most stable Eco-system is ____
a) Mountain b) Ocean c) Population d) Fossil fuels

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Second Semester B.E. Degree Examination, June / July 2014
Engineering Mathematics - II

Time: 3 hrs.

Max. Marks:100

Note:1. Answer FIVE full questions choosing at least two from each part.

2. Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.

3. Answers to objective type questions on sheets other than OMR will not be valued.

PART - A

- 1 a. Choose the correct answer : (04 Marks)
- i) The general solution of the equation $x^2p^2 + 3xyp + 2y^2 = 0$ is _____
- (A) $(y^2x - c)(xy - c) = 0$ (B) $(x-y-c)(x^2 + y^2 - c) = 0$
 (C) $(xy - c)(x^2y - c) = 0$ (D) $(y-x-c)(x^2 + y^2 + c) = 0$
- ii) The given differential equation is solvable for y, if it is possible to express y in terms of _____
- (A) y and p (B) x and p (C) x and y (D) y and x
- iii) The singular solution of Clairaut's equation is _____
- (A) $y = xg(x) + f[g(x)]$ (B) $y = cx + f(c)$
 (C) $cy + f(c)$ (D) $y g^2(x) + f[g(x)]$
- iv) The singular solution of the equation $y = px - \log p$ is _____
- (A) $y^2 = 4ax$ (B) $x = 1 - \log x$ (C) $y = 1 - \log\left(\frac{1}{x}\right)$ (D) $x^2 = y \log x$
- b. Solve $p^2 - 2p \sin h x - 1 = 0$. (04 Marks)
- c. Solve $y = 2px + \tan^{-1}(xp^2)$. (06 Marks)
- d. Obtain the general solution and singular solution of Clairaut's equation is $(y - px)(p-1) = p$. (06 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- i) The complementary function of $[D^4 + 4]x = 0$ is _____
- (A) $x = e^{-t} [c_1 \cos t + c_2 \sin t] + e^t [c_3 \cos t + c_4 \sin t]$
 (B) $x = [c_1 \cos t + c_2 \sin t] + [c_3 \cos t + c_4 \sin t]$
 (C) $x = [c_1 + c_2 t] e^{-t}$
 (D) $x = [c_1 + c_2 t] e^t$
- ii) Find the particular integral of $(D^3 - 3D^2 + 4)y = e^{2x}$ is _____
- (A) $\frac{x^2 e^{2x}}{6}$ (B) $\frac{x^2 e^{3x}}{6}$ (C) $\frac{x^2 e^x}{6}$ (D) $\frac{x^2 e^{4x}}{6}$
- iii) Roots of $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0$ are _____
- (A) $2 \pm i$ (B) $3 \pm i$ (C) $2 \pm 2i$ (D) $-2 \pm i$
- iv) Find the particular integral of $(D^3 + 4D)y = \sin 2x$ is _____
- (A) $\frac{x \sin x}{8}$ (B) $\frac{-x \sin x}{8}$ (C) $\frac{-x \sin 2x}{8}$ (D) $\frac{x \sin 2x}{8}$
- b. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = e^x + 1$. (04 Marks)
- c. Solve $\frac{d^2y}{dx^2} - 4y = \cos h(2x - 1) + 3^x$. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42-8-50, will be treated as malpractice.

d. Solve $\frac{dy}{dx} + y = z e^x$, $\frac{dz}{dx} + z = y + e^x$. (06 Marks)

3 a. Choose the correct answer : (04 Marks)

- i) The Wronskian of x and $x e^x$ is _____
 (A) e^x (B) e^{2x} (C) e^{-2x} (D) e^{-x} .
- ii) The complementary function of $x^2 y'' - xy' - 3y = x^2 \log x$ is _____
 (A) $c_1 \cos(\log x) + c_2 \sin(\log x)$ (B) $c_1 x^{-1} + c_2 x^3$.
 (C) $c_1 x + c_2 x^3$ (D) $c_1 \cos x + c_2 \sin x$.
- iii) To transform $(1+x)^2 y'' + (1+x)y' + y = 2 \sin \log(1+x)$ into a linear differential equation with constant coefficient _____
 (A) $(1+x) = e^t$ (B) $(1+x) = e^{-t}$ (C) $(1+x)^2 = e^t$ (D) $(1-x)^2 = e^t$.
- iv) The equation $a_0(ax+b)^2 y'' + a_1(ax+b)y' + a_2 y = \phi(x)$ is _____
 (A) Simultaneous equation (B) Cauchy's linear equation
 (C) Legendre linear equation (D) Euler's equation.

b. Using the variation of parameters method to solve the equation $y'' + 2y' + y = e^{-x} \log x$. (04 Marks)

c. Solve $x^2 \frac{d^2 y}{dx^2} - (2m-1)x \frac{dy}{dx} + (m^2 + n^2)y = n^2 x^m \log x$. (06 Marks)

d. Obtain the Frobenius method solve the equation
 $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} - y = 0$. (06 Marks)

4 a. Choose the correct answer : (04 Marks)

- i) Partial differential equation by eliminating a and b from the relation $Z = (x-a)^2 + (y-b)^2$ is _____
 (A) $p^2 q^2 = 4z$ (B) $pq = 4z$ (C) $r = 4z$ (D) $t = 4$
- ii) The Lagrange's linear partial differential equation $Pp + Qq = R$ the subsidiary equation is _____
 (A) $\frac{dx}{R} = \frac{dy}{P} = \frac{dz}{Q}$ (B) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ (C) $\frac{dx}{Q} = \frac{dy}{R} = \frac{dz}{P}$ (D) $\frac{dx}{P} + \frac{dy}{Q} + \frac{dz}{R}$
- iii) By the method of separation of variable we seek a solution in the form is _____
 (A) $x = x + y$ (B) $z = x^2 + y^2$ (C) $x = z + y$ (D) $x = x(x) y(y)$
- iv) The solution of $\frac{\partial^2 z}{\partial x^2} = \sin(xy)$ is _____
 (A) $z = -x^2 \sin(xy) + y f(x) + \phi(x)$ (B) $\frac{-\sin(xy)}{y^2} + x f(y) + \phi(y)$
 (C) $z = \frac{-\sin xy}{x^2} + y f(x) + \phi(x)$ (D) None of these.

b. Form the partial differential equation of all sphere of radius 3 units having their centre in the xy - plane. (04 Marks)

c. Solve $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$. (06 Marks)

d. Use the method of separation of variables to solve
 $y^2 \frac{\partial z}{\partial x} + x^2 \frac{\partial z}{\partial y} = 0$. (06 Marks)

PART - B

5 a. Choose the correct answer : (04 Marks)

- i) The value of $\int_0^1 \int_0^x e^{-y} dy dx$ is _____
 (A) 0 (B) 1 (C) 3 (D) $\frac{1}{2}$.

- ii) The value of $\Gamma(1/2)$ is _____
 (A) $2\sqrt{\pi}$ (B) $\pi\sqrt{2}$ (C) $\sqrt{\pi}$ (D) $\sqrt{2\pi}$.
- iii) The integral $\int_0^a \int_y^a \frac{x}{x^2+y^2} dx dy$ after changing the order of integration is _____
 (A) $\int_0^a \int_0^x \frac{x}{x^2+y^2} dy dx$ (B) $\int_0^a \int_0^x \frac{x}{x^2+y^2} dx dy$
 (C) $\int_0^a \int_0^x \frac{x}{x^2+y^2} dx dy$ (D) $\int_0^a \int_0^x \frac{x}{x^2+y^2} dx dy$
- iv) The value of $\beta(3, 1/2)$ is _____
 (A) $\frac{15}{16}$ (B) $\frac{16}{15}$ (C) $\frac{16}{5}$ (D) $\frac{16}{3}$
- b. Change the order of integration in $\int_0^{4a} \int_{\frac{x^2}{4a}}^{\sqrt{ax}} dy dx$ and hence evaluate the same. (04 Marks)
- c. Evaluate $\int_{-c}^c \int_b^b \int_{-a}^a (x^2 + y^2 + z^2) dx dy dz$. (06 Marks)
- d. Prove that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \times \int_0^1 \frac{1}{\sqrt{1+x^4}} dx = \frac{\pi}{4\sqrt{2}}$. (06 Marks)
- 6 a. Choose the correct answer : (04 Marks)
- i) Let S be the closed boundary surface of a region of volume V then for a vector field f defined in V and in S $\int_C f \cdot nds$ is _____
 (A) $\int_V \text{curl } f \, dv$ (B) $\int_V \text{div } f \, dv$ (C) $\int_V \text{grad } f \, dv$ (D) None of these
- ii) If $\int_C f \cdot dr$ where $f = 3xy\hat{i} - y^2\hat{j}$ and C is the part of the parabola $y = 2x^2$ from the region (0, 0) to the point (1, 2) is _____
 (A) $\frac{7}{6}$ (B) $-\frac{7}{6}$ (C) $3x + 3y$ (D) -35
- iii) In the Green's theorem in the plane $\oint_C Mdx + Ndy =$ _____
 (A) $\iint_R \left(\frac{\partial M}{\partial y} + \frac{\partial N}{\partial x} \right) dx dy$ (B) $\iint_R \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) dx dy$
 (C) $\iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$ (D) $\iint_R \left(\frac{\partial N}{\partial x} + \frac{\partial M}{\partial y} \right) dx dy$
- iv) A necessary and sufficient condition that the line integral $\int_C \vec{f} \cdot d\vec{r}$ for any closed curve C is _____.
 (A) $\text{div } \vec{F} = 0$ (B) $\text{div } \vec{F} \neq 0$ (C) $\text{curl } \vec{F} = 0$ (D) $\text{grad } \vec{F} = 0$
- b. Using the divergence theorem, evaluate $\int_S f \cdot nds$ where $f = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ and S is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (04 Marks)
- c. Use the Green's theorem, evaluate $\iint_C (2x^2 - y^2) dx + (x^2 + y^2) dy$ where C is the triangle formed by the lines $x = 0, y = 0$ and $x + y = 1$. (06 Marks)
- d. Verify the Stoke's theorem for $f = -y^3\hat{i} + x^3\hat{j}$ where S is the circle disc $x^2 + y^2 \leq 1, z = 0$. (06 Marks)

7 a. Choose the correct answer : (04 Marks)

i) $L\{\sinh at\} =$ _____

(A) $\frac{s}{s^2 - a^2}$ (B) $\frac{s}{s^2 + a^2}$ (C) $\frac{a}{s^2 - a^2}$ (D) $\frac{a}{s^2 + a^2}$.

ii) If $L\{f(t)\} = F(s)$ then $L\{e^{at}f(t)\}$ is _____

(A) $F(s+a)$ (B) $F(s-a)$ (C) $F(s)$ (D) None of these

iii) $L\left\{\frac{e^t \sin t}{t}\right\}$

(A) $\frac{\pi}{2} + \tan^{-1}(s-1)$ (B) $\frac{\pi}{2} + \tan^{-1} s$ (C) $\frac{\pi}{2} - \cot^{-1} s$ (D) $\cot^{-1}(s-1)$

iv) Transform of unit step function $L\{u(t-a)\}$ is, _____

(A) $\frac{e^{as}}{s}$ (B) $\frac{e^{-s}}{s}$ (C) $\frac{e^{2s}}{s}$ (D) $\frac{e^{-as}}{s}$

b. Evaluate $L\left\{3^t + \frac{\cos 2t - \cos 3t}{t} + t \sin t\right\}$. (04 Marks)

c. Find the Laplace transform of the triangular wave, given by,

$f(t) = \begin{cases} 1 & 0 < t < C \\ 2C - t & C < t < 2C \end{cases}$ and $f(t+2c) = f(t)$. (06 Marks)

d. Express $f(t) = \begin{cases} \cos t & \text{if } 0 < t < \pi \\ \cos 2t & \text{if } \pi < t < 2\pi \\ \cos 3t & \text{if } t > 2\pi \end{cases}$ in terms of unit step function and hence find $L\{f(t)\}$.

(06 Marks)

8 a. Choose the correct answer : (04 Marks)

i) $L^{-1}\left\{\cot^{-1}\left(\frac{s}{a}\right)\right\} =$ _____

(A) $\frac{\sin t}{t}$ (B) $\frac{\sin at}{t}$ (C) $\frac{\sinh at}{t}$ (D) $\frac{\sinh t}{t}$

ii) $L^{-1}\left\{\frac{1}{4s^2 - 36}\right\} =$ _____

(A) $\frac{\cosh 6t}{4}$ (B) $\frac{\sin 3t}{12}$ (C) $\frac{\sinh 3t}{12}$ (D) $\frac{\cosh 3t}{6}$

iii) $L^{-1}\left\{\frac{1}{s(s^2 + a^2)}\right\} =$ _____

(A) $\frac{1 - \cos at}{a^2}$ (B) $\frac{1 + \cos at}{a^2}$ (C) $\frac{1 - \sin at}{a^2}$ (D) $\frac{1 + \sin at}{a^2}$

iv) $L^{-1}\left\{\frac{s^2 - 3s + 4}{s^4}\right\} =$ _____

(A) $1 - 3t + 2t^3$ (B) $1 + \frac{1^2}{3}$ (C) $t + \frac{3}{2}t^2 + 1$ (D) $t - \frac{3}{2}t^2 + \frac{2}{3}t^3$

b. Find $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$. (04 Marks)

c. Using Convolution theorem evaluate $L^{-1}\left\{\frac{1}{(s+1)(s^2+4)}\right\}$. (06 Marks)

d. Solve $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 5e^{2t}$ given that $y(0) = 2$, $\frac{dy(0)}{dt} = 1$ by using Laplace transform method.

(06 Marks)
