

First/Second Semester B.E. Degree Examination, June/July 2013 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 your answers for the following: (04 Marks) i) If y = 3^{5x} then y_n is ... ii) If y = cos^2 x then y_n is ... iii) The Lagrange's mean value theorem for the function f(x) = e^x in the interval [0, 1] is ... iv) Expansion of log(1 + e^x) in powers of x is ... b. If y^{1/m} + y^{-1/m} = 2x prove that ... c. Verify the Rolle's theorem for the functions: f(x) = e^x(sin x - cos x) in (pi/4, 5pi/4). d. By using Maclaurin's theorem expand log sec x up to the term containing x^6. 2 a. Choose your answers for the following: (04 Marks) i) The indeterminate form of lim_{x to 0} (a^x - b^x)/x is ... ii) The angle between the radius vector and the tangent for the curves r = a(1 - cos theta) is ... iii) The polar form of a curve is ... iv) The rate at which the curve is bending called ... b. Evaluate lim_{x to 0} ((sin x)/x)^{1/x^2}. c. Find the angles of intersection of the following pairs of curves, r = a/(1+theta); r = a/(1+theta^2). d. Find the radius of curvature at (3a/2, 3a/2) on x^3 + y^3 = 3axy. 3 a. Choose your answers for the following: (04 Marks) i) If u = x^2 + y^2 then (d^2 u)/(dx dy) is equal to ... ii) If z = f(x, y) where x = u - v and y = uv then (u + v)(dz/dx) is ... iii) If x = r cos theta, y = r sin theta then [d(r, theta)]/[d(x, y)] is ... iv) In errors and approximations dx/x, dy/y, df/f are called ... b. If x^x y^y z^z = c, show that d^2 z / dx dy = -[x log ex]^{-1}, when x = y = z. c. Obtain the Jacobian of d(x, y, z)/d(r, theta, phi) for change of coordinate from three dimensional Cartesian coordinates to spherical polar coordinates. d. In estimating the cost of a pile of bricks measured as 2m x 15m x 1.2m, the tape is stretched +1% beyond the standard length. If the count is 450 bricks to 1 cu.cm and bricks cost of 530 per 1000, find the approximate error in the cost. 4 a. Choose your answers for the following: (04 Marks) i) If R = xi + yj + zk then div R ... ii) If F = 3x^2 i - xyj + (a - 3)xz k is Solenoidal then a is equal to ... iii) If F = (x + y + 1)i + j - (x + y)k then F . curl F is ... iv) The scale factors for cylindrical coordinate system (rho, phi, z) are given by ... b. Prove that curl A = g rad(div A) - nabla^2 A. c. Find the constants a, b, c such that the vector F = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k is irrotational. d. Derive an expression for nabla . A in orthogonal curvilinear coordinates. Deduce nabla . A in rectangular coordinates.

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.

5 a. Choose your answers for the following :

i) The value of $\int_0^{\infty} e^{-\alpha x} dx$ is ____ A) $1/e$ B) $-1/e$ C) $1/\alpha$ D) $-1/\alpha$

ii) The value of the integral $\int_0^{\pi/2} \sin^7 x dx$ is A) $35/16$ B) $16/35$ C) $-16/35$ D) $18/35$

iii) The volume generated by revolving the cardioid $r = a(1 + \cos \theta)$ about the initial line is
A) $(3\pi a^2)/8$ B) $(3\pi a^3)/8$ C) $(2\pi a^2)/9$ D) None

iv) The area of the loop of the curve $r = a \sin 3\theta$ is ____ A) $a^2/12$; B) $\pi/12$; C) $\pi a^2/12$; D) None

b. By applying differential under the integral sign evaluate $\int_0^{\pi/2} \frac{\log(1 + y \sin^2 x)}{\sin^2 x} dx$. (06 Marks)

c. Evaluate of $\int_0^{\pi/2} \sin^n x dx$ where n is any integer. (06 Marks)

d. Find the length of the arch of the cycloid $x = a(\theta - \sin \theta)$; $y = a(1 - \cos \theta)$; $0 < \theta \leq 2\pi$. (04 Marks)

6 a. Choose your answers for the following :

(04 Marks)

i) The general solution of the differential equation $(dy/dx) = (y/x) + \tan(y/x)$ is

A) $\sin(y/x) = c$ B) $\sin(y/x) = cx$ C) $\cos(y/x) = cx$ D) $\cos(y/x) = c$

ii) An integrating factor for $ydx - xdy = 0$ is A) x/y B) y/x C) $1/(x^2y^2)$ D) $1/(x^2+y^2)$

iii) The differential equation satisfying the relation $x = A \cos(mt - \alpha)$ is

A) $(dx/dt) = 1 - x^2$ B) $(d^2x/dt^2) = -\alpha^2 x$ C) $(d^2x/dt^2) = -m^2 x$ D) $(dx/dt) = -m^2 x$

iv) The orthogonal trajectories of the system given by $r = a\theta$ is

A) $r^2 = ke^\theta$ B) $r = ke^\theta$ C) $r^2 e^{-\theta^2} = k$ D) $r^2 = k e^{-\theta^2}$

b. Solve $(x \cos(y/x) + y \sin(y/x))y - (y \sin(y/x) - x \cos(y/x))x (dy/dx) = 0$. (06 Marks)

c. Solve $(1 + y^2) + (x - e^{\tan^{-1}y}) dy/dx = 0$. (06 Marks)

d. Prove that the system of parabola $y^2 = 4a(x + a)$ is self orthogonal. (04 Marks)

7 a. Choose your answers for the following :

(04 Marks)

i) Find the rank of $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$: A) 3 B) 2 C) 4 D) 1

ii) The exact solution of the system of equation $10x + y + z = 12$, $x + 10y + z = 12$, $x + y + 10z = 12$ by inspection is equal to
A) $(-1, 1, 1)$; B) $(1, 1, 1)$; C) $(-1, -1, -1)$; D) None

iii) If the given system of linear equations in 'n' variables is consistent then the number of linearly independent - solution is given by
A) n ; B) n-1 ; C) r-n ; D) n-r

iv) The trivial solution for the given system of equations $9x - y + 4z = 0$, $4x - 2y + 3z = 0$, $5x + y - 6z = 0$ is
A) $(1, 2, 0)$ B) $(0, 4, 1)$ C) $(0, 0, 0)$ D) $(1, -5, 0)$

b. Using elementary transformation reduce each of following matrices to the normal form, $\begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & -1 & 2 & 5 \\ 3 & 1 & 1 & 8 \\ 2 & -2 & 3 & 7 \end{bmatrix}$. (06 Marks)

c. Test for consistency and solve the system, $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$. (06 Marks)

d. Apply Gauss-Jordan method to solve the system of equations, $2x + 5y + 7z = 52$, $2x + y - z = 0$, $x + y + z = 9$ (04 Marks)

8 a. Choose your answers for the following :

(04 Marks)

i) A square matrix A is called orthogonal if, A) $A = A^2$ B) $A = A^{-1}$ C) $AA^{-1} = I$ D) None

ii) The eigen values of the matrix, $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ are A) 2, 3, 8 B) 2, 3, 9 C) 2, 2, 8 D) None

iii) The eigen vector X of the matrix A corresponding to eigen value λ and satisfy the equation,

A) $AX = \lambda X$ B) $\lambda(A - X) = 0$ C) $XA - A\lambda = 0$ D) $|A - \lambda I|X = 0$

iv) Two square matrices A and B are similar if, A) $A = B$; B) $B = P^{-1}AP$; C) $A' = B'$; D) $A^{-1} = B^{-1}$

b. Show that the transformation, $y_1 = 2x_1 - 2x_2 - x_3$, $y_2 = -4x_1 + 5x_2 + 3x_3$, $y_3 = x_1 - x_2 - x_3$ is, regular and find the inverse transformations. (06 Marks)

c. Diagonalize the matrix, $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (06 Marks)

d. Reduce the quadratic form, $x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 8x_2x_3$ into sum of squares. (04 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2013
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 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. Physical Constants :** Planck's constant, $h = 6.63 \times 10^{-34}$ Js, Electron charge, $e = 1.6 \times 10^{-19}$ C
Electron mass, $m = 9.11 \times 10^{-31}$ kg, Velocity of light, $C = 3 \times 10^8$ mS⁻¹**PART – A**

- 1 a. Choose the correct answers for the following : (04 Marks)
- If red and blue stars emits radiations of continuous wavelengths, then according to Wien's displacement law.
 A) Blue star is hotter than red star B) Red star is hotter than blue star
 C) Both stars are at same temperature D) Difficult to conclude.
 - The expression for de-Broglie wavelength for an electron under an accelerating potential V is,
 A) $\frac{12.26}{\sqrt{V}}$ m B) $\frac{12.26}{\sqrt{V}}$ A° C) $\frac{12.26}{\sqrt{V}}$ nm D) $\frac{12.26}{\sqrt{V}}$ μm
 - A particle moves with velocity 3×10^6 ms⁻¹. The wavelength associated with it is 1 nm. Then group velocity of the particle is,
 A) 3×10^8 mS⁻¹ B) 3×10^{10} mS⁻¹ C) 3×10^6 mS⁻¹ D) 1.5×10^6 mS⁻¹
 - According to the Compton effect, the wavelength of X-rays scattered at an angle greater than zero,
 A) Decreases B) Doesn't change C) Increases D) None of these
- b. Derive an expression for group velocity on the basis of superposition of waves. Also obtain the relation between group velocity and phase velocity. (08 Marks)
- c. Show that Planck's law reduces to Wien's law and Rayleigh-Jeans law under certain conditions. (05 Marks)
- d. Calculate the de-Broglie wavelength associated with an electron of energy 1.5 eV. (03 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- The energy of the lowest state in one dimensional potential box of length $a = 1$ unit is,
 A) $\frac{h^2}{8m}$ B) zero C) $\frac{h^2}{4ma^2}$ D) $\frac{h^2}{2ma^2}$
 - For a particle which is not bound to any system and is free, the energy eigen value is,
 A) zero B) finite but not quantized
 C) infinity D) finite but quantized
 - If the uncertainty in the position of a particle is equal to its de-Broglie wavelength then uncertainty in its momentum will be,
 A) $\Delta P \geq \frac{h}{4\pi}$ B) $\Delta P \geq \frac{h}{2\pi}$ C) $\Delta P \geq \frac{P}{4\pi}$ D) $\Delta P \geq \frac{h}{P}$
 - For an electron to be present inside the nucleus of an atom the uncertainty in the position of the electron must be,
 A) more than or equal to the radius of the nucleus
 B) more than or equal to the diameter of the nucleus.
 C) more than the diameter of the nucleus
 D) less than or equal to the diameter of the nucleus.

- 2 b. Using time independent Schrodinger's wave equation, obtain the expression for the normalized wave function for a particle in one dimensional potential well of infinite height. (08 Marks)
- c. State Heisenberg's uncertainty principle. Write its physical significance. (04 Marks)
- d. A spectral line of wavelength 5461 \AA has a width of 10^{-4} \AA . Evaluate the minimum time spent by the electrons in the upper energy state. (04 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- i) In the following the ohm's law is,
 A) $J = \sigma E$ B) $J = \frac{\sigma}{E}$ C) $J = \sigma E^2$ D) $J = \frac{E}{\sigma}$
- ii) Mobility of electron is,
 A) Reciprocal of conductivity
 B) Average electrons drift velocity per unit electric field.
 C) Flow of electrons per unit cross sectional area.
 D) Reciprocal of resistivity
- iii) The dependence of mean free path λ on temperature T is,
 A) $\lambda \propto T$ B) $\lambda \propto \sqrt{T}$ C) $\lambda \propto \frac{1}{T}$ D) $\lambda \propto \frac{1}{\sqrt{T}}$
- iv) According to free electron theory, the free electrons are treated as,
 A) Rigidity fixed lattice points B) Liquid molecules
 C) Gas molecule D) None of these
- b. Define Fermi energy and Fermi factor. Discuss the variation of fermifactor with temperature and energy. (08 Marks)
- c. What is mean collision time? Using free electron theory in a metal, obtain an expression for electrical conductivity in terms of mean collision time. (06 Marks)
- d. State and explain Matthiessen's rule. (02 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) Electronic polarization,
 A) Independent of temperature B) Increases with temperature
 C) Decreases with temperature D) None of these
- ii) The correct relation among the following 4 equations is,
 A) $E = \epsilon_0(\epsilon_r - 1)P$ B) $P = \epsilon_0(\epsilon_r - 1)E$ C) $\epsilon_r = \chi - 1$ D) $D = \epsilon_0(\epsilon_r - 1)E$
- iii) For Ferromagnetic substances, the Curie-Wiess law is given as,
 A) $\epsilon_r = \frac{C}{T}$ B) $\epsilon_r = \frac{T - \theta}{C}$ C) $\epsilon_r = \frac{C}{(T - \theta)}$ D) $\epsilon_r = \frac{C}{(T + \theta)}$
- iv) In the inverse piezoelectric effect,
 A) Ultrasonic waves are produced B) Electromagnetic waves are produced
 C) Microwaves are produced D) None of these
- b. What is internal field? Derive an expression for internal field in case of one dimensional array of atoms in dielectric solids. (08 Marks)
- c. Describe magnetic hysteresis in Ferromagnetic material. (05 Marks)
- d. Explain any three applications of piezoelectric material. (03 Marks)

PART – B

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

- i) The pumping action in diode laser is by,
 A) Optical pumping B) Electrical discharge C) Reverse bias D) Forward bias
- ii) The expression for energy density in terms of Einstein's coefficients,

$$\text{A) } U_{\gamma} = \frac{B}{A} \left[\frac{1}{e^{h\nu/KT} - 1} \right]$$

$$\text{B) } U_{\gamma} = \frac{A}{B} \left[\frac{1}{1 - e^{h\nu/KT}} \right]$$

$$\text{C) } U_{\gamma} = \frac{A}{B} \left[\frac{1}{e^{h\nu/KT} - 1} \right]$$

$$\text{D) } U_{\gamma} = \frac{A}{B} \left[e^{h\nu/KT} - 1 \right]$$

- iii) In order to see the image of an object recorded by holography.
 A) It is enough if we just have the hologram.
 B) We need the hologram and the reference beam.
 C) We need the hologram, the reference beam and the object beam.
 D) We need the hologram, the reference beam and the object beam as well as the object.
- iv) In a laser system when the energy difference between two energy levels is 2×10^{-19} J, the average power output of laser beam is found to be 4 mw. Then number of Photons emitted per second is,
 A) 2×10^{16} B) 2×10^{-16} C) 0.5×10^{16} D) 2×10^{19}

- b. Describe the construction of He-Ne laser and explain its working with the help of energy level diagram and mention few applications. (08 Marks)
- c. Explain the terms spontaneous emission and stimulated emission. (04 Marks)
- d. Explain laser welding and cutting process with diagrams. (04 Marks)

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

- i) Superconductors are
 A) Ferromagnetic B) Paramagnetic C) Antiferromagnetic D) Diamagnetic
- ii) All high temperature superconductors are different types of oxides of,
 A) Mercury B) Lead C) Copper D) Tin
- iii) The quantum of magnetic flux is given by,
 A) $\frac{2e}{h}$ B) $\frac{h}{2e}$ C) $\frac{he}{2}$ D) $\frac{2h}{e}$
- iv) Numerical aperture of an optical fiber depends on,
 A) Acceptance angle B) Diameter of the fiber C) Critical angle D) None of these

- b. Discuss point to point optical fiber communication system and mention its advantages over the conventional communication systems. (06 Marks)
- c. Define superconductivity and explain Type I and Type II superconductors. (06 Marks)
- d. The angle of acceptance of an optical fiber is 30° when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. (04 Marks)

- 7 a. Choose the correct answers for the following : (04 Marks)
- A crystal of hexagonal lattice has unit cell with sides,

A) $a \neq b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$	B) $a = b = c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$
C) $a \neq b = c, \alpha = \beta = \gamma = 90^\circ$	D) $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$
 - In Bragg's spectrometer, for every rotation θ of the turn table, the detector turns by an angle,

A) θ	B) 4θ	C) 2θ	D) $\frac{\theta}{2}$
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 - The interatomic distance between the sodium and chlorine atoms in sodium crystal is,

A) 5.68 \AA	B) 2.81 \AA	C) 6.62 \AA	D) 5.51 \AA
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 - The interplanar spacing in a crystal is 1 \AA and the glancing angle is 35° . For the first order Bragg reflection to take place, the wavelength of X-rays is,

A) 1.147 \AA	B) 0.573 \AA	C) 1.638 \AA	D) 0.819 \AA
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- b. What are Miller indices? Explain the procedure to find Miller indices with an example. (05 Marks)
- c. Obtain the expression for interplanar spacing in terms of 'a' for a cubic lattice. (05 Marks)
- d. Calculate the atomic packing factor for SC, FCC and BCC lattices. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- An acoustic grating can be made by,
 - Drawing lines on a glass plate
 - Subjecting an optical grating to pressure waves of ultrasonic frequency
 - It is only theoretical concept.
 - Setting up a standing waves pattern in a liquid using ultrasonic.
 - The velocity of ultrasonic wave through the liquid increases as,

A) Bulk modulus decreases	B) Density decreases
C) Bulk modulus increases	D) Volume increases
 - The minimum size of matter below which the properties becomes size dependent is called,

A) Pico size	B) Nano size	C) Micro size	D) Macro size
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 - The number of carbon atoms present in C_{60} molecule is,

A) 60	B) 32	C) 20	D) 12
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- b. Describe with simple illustrations, the two methods of preparation of nano materials. (06 Marks)
- c. Describe a method of measuring velocity of ultrasonic waves in solids. Using this how you can find the rigidity modulus of the solid. (06 Marks)
- d. Explain quantum structures. (04 Marks)

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10CHE12/22

First/Second Semester B.E. Degree Examination, June / July 2013
Engineering Chemistry

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)
- The driving force for a red – ox reaction in a galvanic cell is due to
 (A) $\Delta G = -nEF$ (B) $\Delta G = nEF$ (C) $\Delta G = 0$ (D) None of these
 - The standard reduction potential of Zn and Fe are -0.76V and -0.44V respectively. The emf of cell formed by combining the above two electrodes will have
 (A) 0.32V (B) -0.32V (C) -1.2V (D) 1.2V
 - When the concentration of chloride ion is silver – silver chloride electrode increases, the reduction potential of the electrode
 (A) increases (B) decreases (C) does not alter (D) None of these
 - Calomel is the commercial name of
 (A) Mercuric chloride (B) Mercurous chloride
 (C) Mercuric sulphate (D) Mercurous sulphate
- b. Define single electrode potential. Derive Nerst's equation for single electrode potential. (06 Marks)
- c. Describe the construction and working of calomel electrode. Write its advantages. (06 Marks)
- d. The emf of the cell $\text{Cu}/\text{CuSO}_4 (0.01\text{M}) \parallel \text{CuSO}_4 (x \text{M}) / \text{Cu}$ is 0.0295V at 25°C. Find the value of x. (04 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- Which of the following is a reserve battery
 (A) Zn – Air battery (B) Ni – MH battery (C) Zn – Ag_2O (D) Li – MnO_2
 - Which of the following is used in cellular phones
 (A) Zn – MnO_2 (B) Zn- air (C) Pb - acid (D) Ni- MH
 - The fuel cells are more superior than the conventional batteries because
 (A) They are light in weight (B) They are not eco friendly
 (C) They produce direct current at low cost
 (D) They are easily fabricated
 - In Zn – Air battery, the cathode of the cell is
 (A) Graphite (B) Air / C (C) Zn / Air (D) Air / KOH
- b. Describe the construction and working of lead – acid battery. (06 Marks)
- c. What are fuel cells? Describe the construction and working of a $\text{CH}_3\text{OH} - \text{O}_2$ fuel cell. (06 Marks)
- d. Explain the following battery characteristics i) Energy efficiency ii) Cycle life. (04 Marks)

- 3 a. Choose the correct answer : (04 Marks)
- i) Insoluble corrosion product formed during corrosion process leads
 - (A) To prevent further corrosion
 - (B) Has no effect on corrosion
 - (C) To enhance further corrosion
 - (D) None of these
 - ii) At high hydrogen over voltage, the rate of corrosion
 - (A) Increases
 - (B) Decreases
 - (C) Increases initially and then decreases
 - (D) Remains the same.
 - iii) Which of the following factors accounts for lower corrosion rate
 - (A) Large anodic area and small cathodic area
 - (B) Small anodic area and large cathodic area
 - (C) High temperature
 - (D) High humidity
 - iv) Caustic embrittlement is a classic example of
 - (A) Differential aeration corrosion
 - (B) Stress corrosion
 - (C) Differential metal corrosion
 - (D) None of these
- b. What is corrosion? Explain the electrochemical theory of corrosion with respect to iron. (06 Marks)
- c. Explain the type of corrosion occurring in the following cases.
- i) Presence of small dust particles on iron surface for a long time.
 - ii) Copper nut is contact with iron bolt. (06 Marks)
- d. What is anodizing? Explain the anodizing of Aluminium. (04 Marks)
- 4 a. Choose the correct answer : (04 Marks)
- i) The experimentally determined discharge potential of an electrode is 2.57V and its theoretical discharge potential is 1.53V, then over voltage is
 - (A) 3.345V
 - (B) - 1.04V
 - (C) 4.10V
 - (D) 1.04V
 - ii) Electroless plating process is possible only on
 - (A) Catalytically active surface
 - (B) Inactive surface
 - (C) Any surface
 - (D) None of these
 - iii) Which of the following is essential in electroless plating
 - (A) Oxidising agent
 - (B) Reducing agent
 - (C) Anode
 - (D) Electrical energy
 - iv) Driving force in electroless plating process is
 - (A) Power supply
 - (B) Oxidising agent
 - (C) Auto catalytic red-ox reaction
 - (D) None of these
- b. Explain the following factors influencing the rate of electro deposit.
- i) Current density
 - ii) Wetting agent
 - iii) pH (06 Marks)
- c. Discuss the process of electroless plating of copper. (04 Marks)
- d. Explain the terms : i) Decomposition potential ii) Over voltage. (06 Marks)

PART – B

- 5 a. Choose the correct answer : (04 Marks)
- i) Zone refining technique for purification of solar grade silicon is based on
(A) Henry's law (B) Newton's law (C) Partition law (D) Phase rule
- ii) Which of the following is not a secondary fuel?
(A) Coal gas (B) Water gas (C) Producer gas (D) Natural gas
- iii) Methyl tertiary butyl ether is added to the gasoline to
(A) Increase the octane number (B) Minimizing knocking
(C) Increase the efficiency of IC engine (D) All the above
- iv) Catalysts used in catalytic converters are
(A) Pt, Pd and Rh (B) Ni, Co and Cr (C) Al_2O_3 and SiO_2 (D) Zeolite
- b. What is knocking in IC engines? Explain its mechanism with chemical reaction. Mention its ill effects. (06 Marks)
- c. What is meant by cracking? Describe the fluidized bed catalytic cracking process. (06 Marks)
- d. Calculate the calorific value of a sample of coal from the following data: (04 Marks)

Mass of coal	= 0.95g
Mass of water in copper calorimeter	= 2000g
Water equivalent of calorimeter	= 700g
Rise in temperature	= 2.8°C
Sp. heat of water	= 4.187 kJ/kg/°C

- 6 a. Choose the correct answers : (04 Marks)
- i) In flame photometry, the emitted radiation lies in
(A) IR range (B) uv range (C) Visible range (D) None of these
- ii) In the estimation of FAS by potentiometry the indicator electrode used is
(A) Silver-silver chloride electrode (B) Platinum electrode
(C) Calomel electrode (D) Glass electrode
- iii) Lambert's law states that intensity of monochromatic light decrease exponentially with
(A) Concentration (B) Path length (C) Time (D) Density
- iv) Gibb's phase rule is applicable to
(A) Heterogeneous systems (B) Heterogeneous systems is equilibrium
(C) Homogeneous systems (D) All of these
- b. State the phase rule and explain the terms involved with examples. (06 Marks)
- c. Draw the phase diagram for water system and explain the salient features. (06 Marks)
- d. Write brief note on conduct metric titrations. (04 Marks)

- 7 a. Choose the correct answers : (04 Marks)
- Natural rubber is the polymerized form of
(A) Chloroprene (B) Isoprene (C) Propene (D) Styrene
 - A polymer of high optical clarity used in preparation of lenses is
(A) Teflon (B) Phenol formaldehyde (C) Neoprene (D) PMMA
 - Which one among is a conducting polymer
(A) Aniline (B) Pyrrole (C) Polyacetylene (D) Acetylene
 - Very high molecular weight polymers will have,
(A) low Tg (B) High Tg (C) Moderate Tg (D) No Tg
- b. What are polymers? Discuss the free radical mechanism of polymerization of ethylene. (06 Marks)
- c. Give the synthesis and an application of, i) Butyl rubber ii) PMMA. (06 Marks)
- d. Describe the synthesis and applications of Kevlar fibre. (04 Marks)
- 8 a. Choose the correct answers : (04 Marks)
- Secondary treatment of sewage is carried out to reduce,
(A) Organic load (B) Inorganic load (C) Destroy microorganisms (D) None of these
 - Complexing agent for spectrometric analysis of nitrates is,
(A) SPADNS (B) Ammonia
(C) Phenol Sulphonic acid (D) Phenol disulphonic acid
 - The method used for desalination of water is,
(A) Zeolite process (B) Lime-soda process
(C) Ion-exchange process (D) Reverse osmosis process
 - The indicator used for the estimation of total hardness of a given water sample by EDTA method.
(A) Starch (B) Eriochrome black-T (C) Ferroin (D) Methylene orange
- b. What is desalination? Explain the desalination of water by electrodialysis (06 Marks)
- c. Explain the argentometric method of determination of chloride in water. Write the reactions involved. (06 Marks)
- d. Explain the terms: i) BOD ii) COD. (04 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2013

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)
- The term dots per inch (dpi) refers to printer's _____.
 A) resolution B) speed C) output D) colours
 - _____ is used to identify product and provide information such as price.
 A) Price check B) Bar code reader
 C) Numeric digit D) Light sensitive detector
 - _____ is not a computer language.
 A) Assembly language B) High level language
 C) Natural language D) Machine level language
 - Which operating system first appeared with IBM PC?
 A) Windows B) Linux C) Mac OS D) DOS
- b. What is information processing cycle? Explain four steps with flow chart. (04 Marks)
- c. With a neat diagram, explain functions of each units of basic model of computer. (06 Marks)
- d. Convert the following:
 i) $(10101)_2 = (?)_{10} = (?)_{16}$ ii) $(50)_8 = (?)_{10} = (?)_2$ (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- _____ is two or more LAN's connected together across large geographical area.
 A) GAN B) LAN C) WAN D) MLAN
 - Temporary storage in main memory is called as _____.
 A) Buffer B) Secondary memory
 C) Tertiary memory D) None of these
 - Which of the following unit represents largest amount of data?
 A) Kilobyte B) Terabyte C) Gigabyte D) Megabyte
 - Identification number of every computer connected to internet is _____.
 A) Sub net mask B) Gate way C) MAC address D) IP address
- b. Explain basic components of a network. (04 Marks)
- c. Define operating system. Discuss functions of operating system. (06 Marks)
- d. Explain working of hard disk with a neat diagram. Give advantages and disadvantages. (06 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- The number 0987 is _____ integer.
 A) octal B) decimal C) hexadecimal D) invalid
 - What kind of language is C?
 A) Machine language B) Procedural language
 C) Assembly language D) Object oriented language

- 3 a. iii) The result after evaluating the expression $1/2 * 4$ is _____.
 A) 0.25 B) 2 C) 0 D) 0.125
- iv) What is the output if following program executed?
- ```
main ()
{
 printf("%d", 'A');
}
```
- A) 65                      B) A                      C) "A"                      D) Error
- b. Explain software development and life cycle. (04 Marks)
- c. What are identifiers? Discuss the rules to be followed while naming identifiers. Give examples. (06 Marks)
- d. Explain format specifiers used in scanf( ) function to read int, float, char, double and longint data types. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) An operator which acts on two operands to produce result is \_\_\_\_\_ operator.  
 A) ternary                      B) binary                      C) unary                      D) complex
- ii) The modulus operator (%) can be used only for \_\_\_\_\_ values.  
 A) floating                      B) integer  
 C) both integer and floating                      D) all data type
- iii) In C, TRUE is represented by  
 A) true                      B) zero                      C) non-zero                      D) 1
- iv) Which of the following is not valid assignment statement?  
 A)  $i + j = 23$                       B)  $j = 23$                       C)  $j + = 23$                       D)  $j = 23 + i$
- b. Write C program to swap values of two integers without using third variable and give flow chart for the same. (06 Marks)
- c. Find the result of each of the following expressions with  $i = 4, j = 2, k = 6, a = 2$ .
- i)  $k * = i + j$                       ii)  $j = i / = k$                       iii)  $i \% = i / 3$   
 iv)  $m = i + (j = 2 + k)$                       v)  $a = i * (j / = k / 2)$  (10 Marks)

**PART – B**

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) In c, default return type of function is \_\_\_\_\_.  
 A) void                      B) int                      C) float                      D) char
- ii) Parameters used in function call are \_\_\_\_\_ parameters.  
 A) formal                      B) local                      C) dummy                      D) actual
- iii) Every C program must have \_\_\_\_\_.  
 A) user defined function                      B) standard function  
 C) main function                      D) library function
- iv) Arguments of a function are separated with \_\_\_\_\_.  
 A) comma ( , )                      B) semicolon ( ; )                      C) colon ( : )                      D) blank space ( \b )
- b. Write C program to print n fibonacci numbers using function. (08 Marks)
- c. Differentiate call by value and call by address parameter passing mechanisms. (04 Marks)
- d. Explain the scope of local and global variables with simple example. (04 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) break statement can be used in \_\_\_\_\_.  
 A) if                      B) if - else                      C) nested if                      D) while



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**First/Second Semester B.E. Degree Examination, June/July 2013**  
**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 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. Assume missing data suitably.

**PART – A**

- 1 a. Choose the correct answers for the following : (04 Marks)
- Geotechnical engineering involves the study of,  
 A) Water                      B) Soil                      C) Air                      D) All of these
  - By-pass road is constructed,  
 A) Inside the city                      B) Over the main road  
 C) Around the city                      D) None of these
  - The part of civil engineering which deals with waste water and solid waste is called,  
 A) Water supply engineering                      B) Geotechnical engineering  
 C) Sanitary engineering                      D) Structural engineering
  - A bascule bridge is a,  
 A) Floating bridge    B) Arch bridge    C) Suspension bridge    D) Movable bridge
- b. Write a note on role of civil engineer in infrastructural development. (10 Marks)
- c. Name the different types of roads as per Nagpur plan. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- Moment of a force can be defined as the product of force and \_\_\_\_\_ distance from the line of action of force to the moment center.  
 A) Least                      B) Maximum                      C) Any                      D) None of these
  - Effect of force on a body depends on,  
 A) Direction                      B) Magnitude                      C) Position                      D) All of these
  - The forces which meet at one point have their line of action in different plane are called,  
 A) Coplanar concurrent forces                      B) Non coplanar concurrent forces  
 C) Non coplanar non concurrent forces                      D) None of these
  - Couple means two forces acting parallel,  
 A) Equal in magnitude and in the same direction.  
 B) Not equal in magnitude but in the same direction.  
 C) Equal in magnitude but opposite in direction.  
 D) None of these
- b. Define force and state its characteristics. (06 Marks)
- c. Determine the magnitude and direction of the resultant for the system of forces shown in Fig. Q2 (c). Use classical method. (10 Marks)

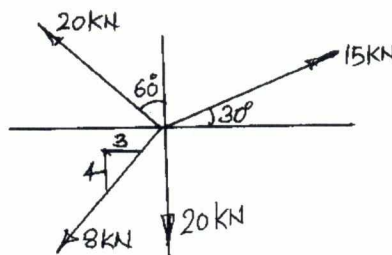


Fig. Q2 (c)

- 3 a. Choose the correct answers for the following : (04 Marks)
- The technology of finding the resultant of a system of forces is called,  
A) Resultant                      B) Resolution                      C) Composition                      D) None of these
  - Equilibrant in nothing but a resultant,  
A) Equal in magnitude and in the same direction.  
B) Equal in magnitude but opposite in direction.  
C) Not equal in magnitude but in the same direction.  
D) Not equal in magnitude and opposite in direction.
  - If two forces P and Q ( $P > Q$ ) act on the same straight line but in opposite direction their resultant is  
A)  $P + Q$                       B)  $P/Q$                       C)  $Q - P$                       D)  $P - Q$
  - In coplanar concurrent force system if  $\sum H = 0$  then the resultant is  
A) Horizontal                      B) Vertical                      C) Moment                      D) None of these
- b. State and prove Varignon's theorem of the moments. (06 Marks)
- c. Two spheres each of radius 100mm and weight 5kN is in a rectangular box as shown in Fig. Q3 (c). Calculate the reactions at the point of contacts. (10 Marks)

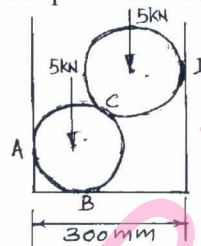


Fig. Q3 (c)

- 4 a. Choose the correct answers for the following : (04 Marks)
- Moment of total area about its centroidal axis is  
A) Twice the area                      B) Three times the area                      C) Zero                      D) None of these
  - The centroid of a semicircle of radius R about its centroidal axis parallel to its diametric axis is  
A)  $3R/4\pi$                       B)  $3R/8\pi$                       C)  $4R/\pi$                       D)  $4R/3\pi$
  - An axis over which one half of the plane figure is just mirror of the other half which is  
A) Bottom most axis of the figure                      B) Axis of symmetry  
C) Unsymmetrical axis                      D) None of these
  - Centroid of a rectangle of base width b and depth d is  
A)  $b/3$  and  $d/3$                       B)  $b/2$  and  $d/2$                       C)  $b/4$  and  $d/4$                       D) None of these.
- b. Determine the centroid of a triangle by the method of integration. (06 Marks)
- c. Locate the centroid of the lamina shown in Fig. Q4 (c) with respect to point O. (10 Marks)

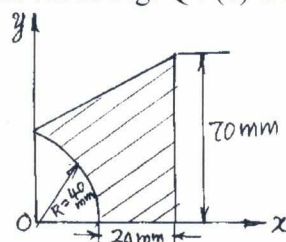


Fig. Q4 (c)

**PART - B**

- 5 a. Choose the correct answers for the following : (04 Marks)
- The necessary condition of equilibrium of a coplanar concurrent force system is algebraic sum of \_\_\_\_\_ must be zero.  
A) Horizontal and vertical forces                      B) Moment of forces  
C) Horizontal, vertical and moment of forces                      D) None of these

## Q5 (a) Contd....

- ii) In non concurrent force system if  $\sum H = 0$ ,  $\sum V = 0$  then the resultant is  
 A) Horizontal      B) Vertical      C) Moment      D) Zero
- iii) The force which is equal and opposite to the resultant is  
 A) Resultant force      B) Force      C) Equilibrant      D) None of these
- iv) The procedure of resolution is  
 A) To find the resultant of the force system  
 B) To break up an inclined force in to two components  
 C) To find the equilibrant  
 D) None of these

- b. Determine the reactions at the point of contact for the sphere shown in Fig. Q5 (b). (06 Marks)

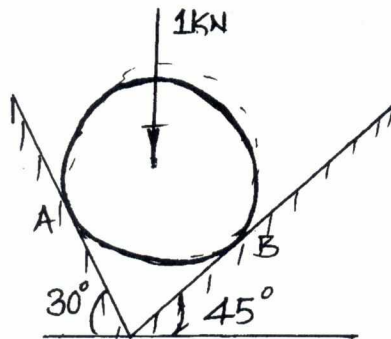


Fig. Q5 (b)

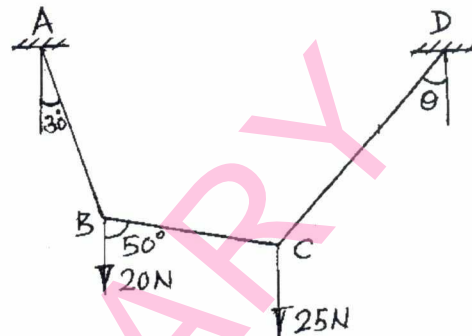


Fig. Q5 (c)

- c. Determine the angle  $\theta$  for the system of strings ABCD in equilibrium as shown in Fig. Q5 (c). (10 Marks)

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

- i) Statically determinate beams are,  
 A) The beams which can be analyzed completely using static equations of equilibrium  
 B) The beams which can be without using static equations of equilibrium  
 C) Fixed beams  
 D) None of these
- ii) Fixed beams are,  
 A) One end is fixed and the other is simply supported  
 B) Both ends are fixed  
 C) Both ends are roller supported  
 D) One end is fixed and the other is free.
- iii) The number of reaction components at fixed end of a beam are,  
 A) 2      B) 3      C) 4      D) None of these
- iv) U.D.L. stands for  
 A) Uniform dead load      B) Uniform distributed load  
 C) Uniform door load      D) All of these

- b. Explain different types of supports. (06 Marks)

- c. Determine the reactions at the support for the beam shown in Fig. Q6 (c). (10 Marks)

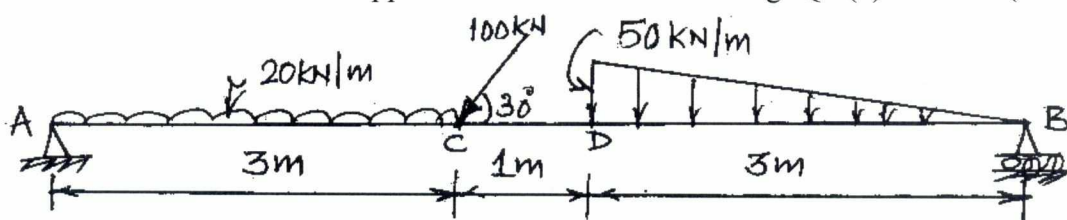


Fig. Q6 (c)



- 7 a. Choose the correct answers for the following :
- Angle of friction is angle between
    - the incline and horizontal
    - the normal reaction and friction force
    - the weight of the body and the friction force
    - Normal reaction and the resultant.
  - The force of friction developed at the contact surface is always
    - Parallel to the plane and along the direction of the applied force
    - Perpendicular to the plane
    - Parallel to the plane and opposite to the direction of the motion
    - All of these.
  - The maximum inclination of the plane on which the body free from external forces can repose is called
    - Cone of friction
    - Angle of friction
    - Angle of repose
    - None of these
  - The force of friction depends on
    - Area of contact
    - Roughness of the surface
    - Both area of contact and roughness of the surface
    - None of these.
- b. State the laws of static friction. (04 Marks)
- c. A uniform ladder of length 15m and weight 750N rests against a vertical wall making an angle of  $60^\circ$  with the horizontal. Co-efficient of friction between the wall and the ladder is 0.3 and between the ground and the ladder is 0.25. A man weighing 500N ascends the ladder. How long will he be able to go before the ladder slips? (12 Marks)

- 8 a. Choose the correct answers for the following : (04 Marks)
- The unit of radius of Gyration is
    - mm
    - $\text{mm}^2$
    - $\text{mm}^3$
    - $\text{mm}^4$
  - The moment of inertia of an area about an axis which is in a plane perpendicular to the area is called
    - Radius of Gyration
    - Polar moment of inertia
    - Second moment of area
    - None of these
  - The moment of inertia of a circle with 'd' as its diameter about its centroidal axis
    - $\frac{\pi D^2}{32}$
    - $\frac{\pi D^2}{64}$
    - $\frac{\pi D^4}{32}$
    - $\frac{\pi D^4}{64}$
  - The moment of inertia of a square of side 'b' about an axis through its centroid is
    - $\frac{b^4}{12}$
    - $\frac{b^4}{8}$
    - $\frac{b^4}{36}$
    - $\frac{b^3}{12}$
- b. State and prove parallel axis theorem. (06 Marks)
- c. Find the moment of inertia of the region shown in Fig. Q8 (c) about horizontal axis AB and also find the radius of Gyration about the same axis. (10 Marks)

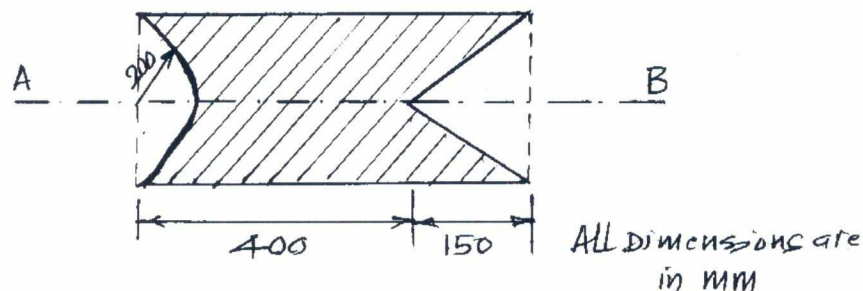


Fig. Q8 (c)

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**First/Second Semester B.E. Degree Examination, June/July 2013**  
**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.

**PART – A**

- 1 a. Choose the correct answers for the following : (04 Marks)
- i) Lunar is \_\_\_\_\_ form of energy
- A) Stored B) Transitional  
 C) Celestial D) Capital
- ii) Enthalpy is also called as \_\_\_\_\_
- A) Sufficient heat B) Insufficient heat  
 C) Total heat D) Incomplete heat
- iii) Steam pressure is \_\_\_\_\_ in water tube boilers
- A) Low B) High  
 C) Medium D) Absolute
- iv) Feed check valve is a boiler mounting for \_\_\_\_\_
- A) Safety B) Operation  
 C) Testing D) Security
- b. Compare and contrast renewable and non renewable energy sources. (06 Marks)
- c. Enumerate the advantages and disadvantages of superheated steam. (04 Marks)
- d. Explain briefly air preheater, superheater and Chimney with respect to boilers. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- i) An example for a reaction turbine is
- A) Laval turbine B) Curtis turbine  
 C) Zoelly turbine D) Parson's turbine
- ii) The weight to power ratio of a gas turbine is
- A) High B) Less  
 C) Moderate D) Equal
- iii) Draft tube is a \_\_\_\_\_ steel pipe
- A) Closed B) Open  
 C) Converging D) Diverging
- iv) Kaplan turbine is a \_\_\_\_\_ head turbine
- A) High B) Low  
 C) Medium D) Simple
- b. With a neat sketch, explain the working principle of an impulse turbine. (06 Marks)
- c. List any four differences between closed cycle and open cycle gas turbines. (04 Marks)
- d. Define radial flow, axial flow and mixed flow with respect to water turbine. (06 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- Flywheel is used as an energy \_\_\_\_\_  
 A) Receiver  
 B) Reservoir  
 C) Mixer  
 D) Multiplier
  - Mechanical efficiency of a four-stroke engine is  
 A) Medium  
 B) High  
 C) Low  
 D) Balanced
  - The output shaft in IC engines is  
 A) Camshaft  
 B) Crankshaft  
 C) Rotary shaft  
 D) Axial shaft
  - In C.I. engines, charge means  
 A) Air and fuel  
 B) Only fuel  
 C) Air and water  
 D) Only air
- b. List any four differences between two-stroke and four-stroke engines. (04 Marks)
- c. A six cylinder 4-stroke I.C. engine develops 50 kW of indicated power at mep of 700 kPa. The bore and stroke length are 70mm and 100mm respectively. If the engine speed is 3700 rpm, find the average misfires per unit time. (06 Marks)
- d. Draw a schematic diagram of I.C. engines and name the parts. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- Brine is an example for  
 A) Coolant  
 B) Effluent  
 C) Deodorant  
 D) Refrigerant
  - The value of COP is greater than  
 A) Infinity  
 B) Ten  
 C) Unity  
 D) Hundred
  - A thermostat in A.C. is used to control  
 A) Pressure  
 B) Temperature  
 C) Volume  
 D) Efficiency
  - The viscosity of an ideal refrigerant should be  
 A) Low  
 B) High  
 C) Moderate  
 D) Unity
- b. Mention the uses of any four refrigerants. (04 Marks)
- c. With a neat sketch, explain the working of a vapour absorption refrigerator. (06 Marks)
- d. List the differences between vapour compression refrigeration and vapour absorption refrigeration. (06 Marks)

## PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Compound side swiveling method is used to produce
 

|          |            |
|----------|------------|
| A) Hole  | B) Threads |
| C) Knurl | D) Taper   |
  - Lathe Dog is
 

|                 |                |
|-----------------|----------------|
| A) A part       | B) A component |
| C) An accessory | D) An assembly |
  - \_\_\_\_\_ is an operation to produce a conical surface at the end of a predrilled hole
 

|                   |                    |
|-------------------|--------------------|
| A) Counter Boring | B) Counter sinking |
| C) Tapping        | D) Reaming         |
  - The supporting section (core) of a drill is called
 

|         |           |
|---------|-----------|
| A) Web  | B) Tang   |
| C) Land | D) Margin |
- b. With a neat sketch, explain the principle and operation to produce a 'taper' on lathe by tail stock set over method. (06 Marks)
- c. Differentiate between cross slide and compound slide. (04 Marks)
- d. With a neat sketch, explain the operation of a radial drilling machine. (06 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- Conventional milling is also called
 

|                       |                  |
|-----------------------|------------------|
| A) End milling        | B) Climb milling |
| C) Peripheral milling | D) Up milling    |
  - The milling process used to produce V – blocks is called
 

|                    |                 |
|--------------------|-----------------|
| A) Form milling    | B) Slot milling |
| C) Angular milling | D) Slab milling |
  - Flint is an example for a \_\_\_\_\_ abrasive
 

|               |            |
|---------------|------------|
| A) Artificial | B) Natural |
| C) Strong     | D) Weak    |
  - The bond used for manufacturing elastic grinding wheels is called
 

|             |                   |
|-------------|-------------------|
| A) Shellac  | B) Vitrified      |
| C) Resinoid | D) Oxy – chloride |
- b. Differentiate between up milling and down milling. (06 Marks)
- c. List any four differences between horizontal milling machine and vertical milling machine (04 Marks)
- d. With a neat sketch, explain the principle of centreless cylindrical grinding. (06 Marks)

- 7 a. Choose correct answers for the following : (04 Marks)
- i) Spelter is used in,  
 A) Welding  
 C) Soldering  
 B) Brazing  
 D) Electroplating
- ii) \_\_\_\_\_ is used as flux in welding,  
 A) Sodium phosphate  
 C) Sodium silicate  
 B) Sodium carbonate  
 D) Sodium chloride
- iii) A good lubricant should be,  
 A) Highly volatile  
 C) Less volatile  
 B) Non-volatile  
 D) Moderately volatile
- iv) Collar bearing is an example for,  
 A) Radial bearing  
 C) Thrust bearing  
 B) Journal bearing  
 D) Sleeve bearing
- b. With a neat sketch explain a foot step bearing. (06 Marks)
- c. Explain splash lubrication with a neat sketch. (06 Marks)
- d. Differentiate between welding and brazing. (04 Marks)
- 8 a. Choose correct answers for the following : (04 Marks)
- i) V-belts are,  
 A) Repairable  
 C) Quickly repairable  
 B) Not repairable  
 D) Easily repairable
- ii) Belts transmit motion by \_\_\_\_\_,  
 A) Friction  
 C) Suction  
 B) Abrasion  
 D) Expulsion
- iii) The surface of the tooth below the pitch circle is called \_\_\_\_\_,  
 A) Clearance  
 C) Backlash  
 B) Flank  
 D) Face
- iv) Module indicates the \_\_\_\_\_ of the pitch,  
 A) Whole  
 C) Total  
 B) Fraction  
 D) Integration
- b. Differentiate between an open belt drive and cross belt drive. (04 Marks)
- c. Enumerate the advantages and disadvantages of gear drives. (06 Marks)
- d. A V-belt drive transmits 10 kW power at 240 rpm. The grooved pulley has a mean diameter of 1.2 m and groove angle of  $45^\circ$ . Taking  $\mu = 0.3$  and angle of lap equal to  $\pi$  radians, determine the tensions on each side of the belt. (06 Marks)

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**First/Second Semester B.E. Degree Examination, June/July 2013**  
**Basic Electrical Engineering**

Time: 3 hrs.

Max. Marks:100

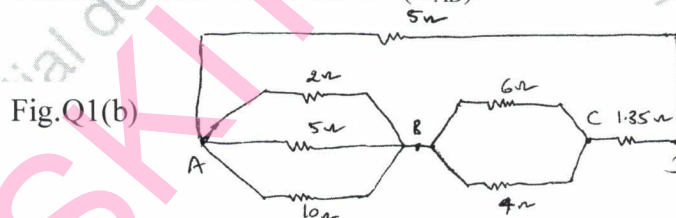
- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.  
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.  
 3. Answer to objective type questions on sheets other than OMR will not be valued.

**PART – A**

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

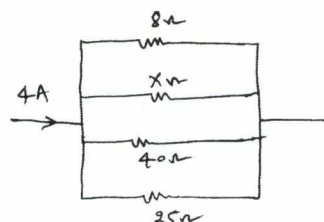
- i) The condition for the validity under Ohm's law is that the  
 A) temperature should remain constant  
 B) current should be proportional to voltage  
 C) resistance must be wire wound type  
 D) all of the above.
- ii) A linear resistor is one which obey's  
 A) Ampere's law B) Lenz's law C) ohms law D) Kirchhoff's law
- iii) The resistance of a conductor having length  $\ell$ , area of cross section  $a$  and resistivity  $\rho$  is given as  
 A)  $R = \frac{\rho a}{\ell}$  B)  $R = \frac{\rho \ell}{a}$  C)  $R = \rho \ell a$  D)  $R = \frac{\ell}{\rho a}$
- iv) Resistance of a wire always increases if  
 A) temperature is reduced  
 B) temperature is increased  
 C) number of free electrons available become less  
 D) number of free electrons available become more.

- b. Find the resistance of the circuit shown ( $R_{AD}$ ). (05 Marks)



- c. State and explain Kirchoff's laws. (05 Marks)

- d. In the parallel arrangement of resistors shown the current flowing in the  $8\Omega$  resistor is 2.5amperes. Find i) current in other resistors ii) resistor X iii) the equivalent resistance. Refer fig. Q1(d). (06 Marks)



- 2 a. Choose the correct answers for the following : (04 Marks)
- The law that finds application in electrolysis  
A) Faraday's law B) Coulomb's law C) Ohm's law D) Lenz's law
  - According to Faraday's law of electro magnetic induction an emf is induced in a conductor whenever it  
A) lies in a magnetic field B) lies perpendicular to the magnetic field  
C) cuts the magnetic flux D) moves parallel to the direction of magnetic field.
  - "In all cases of electromagnetic induction, an induced voltage will cause a current to flow in a closed circuit in such a direction that the magnetic field which is caused by that current will oppose the change that produces the current" is the original statement of  
A) Lenz's law B) Faraday's law of magnetic induction  
C) Fleming's law of induction D) Ampere's law
  - Which law is synonymous to the occurrence of diamagnetism  
A) Ampere's law B) Maxwell's law C) Coulomb's law D) Lenz's law.
- b. State and explain Faraday's laws of electromagnetic induction. (08 Marks)
- c. Derive the expression for energy stored in an inductor. (08 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- The form factor is the ratio of  
A) average value to rms value B) rms value to average value  
C) peak value to average value D) peak value to rms value
  - In an R – L series circuit the pf is  
A) leading B) lagging C) zero D) unity
  - The power factor of an ac circuit is equal to  
A) cosine of the angle B) sine of the phase angle  
C) unity for a resistive circuit D) unity for a reactive circuit
  - In a pure capacitive circuit, the current will  
A) lag behind the voltage by  $90^\circ$  B) lead the voltage by  $90^\circ$   
C) remain in phase with voltage D) None of these
- b. Derive an expression for the impedance of an ac circuit consisting of a resistance an inductance and a capacitance connected in series. (10 Marks)
- c. 125 volts at 60Hz is applied across a capacitance connected in series with a non inductive resistor. The combination carries a current of 2.2A and causes a power loss of 96.8 w in the resistor. Power loss in the capacitor is negligible. Calculate the resistance and capacitance. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- In a 3 phase balanced star – connected load, neutral current is equal to  
A) Zero B)  $I_p$  C)  $I_L$  D) Unpredictable
  - The relationship between the line and phase voltage of a delta connected circuit is given by  
A)  $V_L = V_p$  B)  $V_L = \sqrt{3} V_p$  C)  $V_L = \frac{V_p}{\sqrt{2}}$  D)  $V_L = \frac{2}{\pi} V_p$
  - The power in a 3 phase system is given by  $\sqrt{3} V_L I_L \cos \phi$ , where  $\phi$  is the phase angle between  
A) line voltage and line current B) phase voltage and phase current  
C) line voltage and phase current D) phase voltage and line current

- iv) Three equal impedances are first connected in delta across a 3 - phase balanced supply. If the same impedances are connected in star across the same supply  
 A) phase currents will be one - third      B) line currents will be one - third  
 C) power consumed will be one - third      D) None of these
- b. Derive the relationship between a line current and a phase current and a line voltage and phase voltage related to a star connected load. **(07 Marks)**
- c. Mention different types of wiring used in domestic dwellings. **(03 Marks)**
- d. Explain construction and working principle of induction type single phase energy meter. **(06 Marks)**

**PART - B**

- 5 a. Choose the correct answers for the following : **(04 Marks)**
- i) The emf generated in a dc generator depends upon  
 A) brush contact drop      B) commutation  
 C) number of parallel paths      D) terminal voltage
- ii) The dc generator having residual magnetism gives zero induced emf, the speed will be  
 A) zero      B) very small      C) rated one      D) any
- iii) The field coils of a dc machine are made of  
 A) carbon      B) copper      C) mica      D) steel
- iv) The rotating part of a dc machine is called the  
 A) rotor      B) field      C) armature      D) stator
- b. The emf generated in the armature of a shunt generator is 625 volts, when delivering its full load current of 400 A to the external circuit. The field current is 6 amp and the armature resistance is  $0.06\Omega$ . What is the terminal voltage? **(08 Marks)**
- c. A 220 volts series motor is taking a current of 40 amperes. Resistance of armature  $0.5\Omega$ , resistance of series field is  $0.25\Omega$ . Calculate i) Voltage at the brushes ii) Back emf iii) Power wasted in armature iv) Power wasted in series field. **(08 Marks)**
- 6 a. Choose the correct answers for the following : **(04 Marks)**
- i) Transformer is used  
 A) to step up the voltage      B) to step down the voltage  
 C) on dc      D) to step up or step down the voltage
- ii) A transformer does not transform  
 A) power      B) voltage      C) current      D) impedance
- iii) In a transformer, electrical power is transferred from primary to secondary  
 A) through air      B) by magnetic flux  
 C) through insulating medium      D) none of these
- iv) The two windings of a transformer are  
 A) conductively linked      B) inductively linked  
 C) not linked at all      D) electrically linked
- b. Explain principle of operation of a single phase transformer and derive the EMF equation. **(08 Marks)**
- c. A single phase, 20 KVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is  $100\text{cm}^2$ . When the primary winding is connected to 500V , 50Hz supply, calculate i) the maximum value of the flux density in the core ii) the voltage induced in the secondary winding and iii) the primary and secondary full load currents. **(08 Marks)**



- 7 a. Choose correct answers for the following : (04 Marks)
- In a synchronous machine, the stator frame is made of,
    - Stain steel
    - CRC<sub>0</sub>GS
    - Cast iron or welded steel plates
    - Laminated silicon steel
  - The stator core of a synchronous machine is laminated so as to reduce,
    - Eddy current loss
    - Hysteresis
    - Both eddy current and hysteresis loss
    - The size and weight of the machine
  - The stator slot insulations in synchronous made of,
    - Mica cloth
    - Fibre glass
    - Polister sheets
    - Any of these
  - The machine that supplies dc to the rotor is called the,
    - Rectifier
    - Exciter
    - Convertor
    - Invertor
- b. Derive EMF equation of an alternator. (08 Marks)
- c. Explain construction and working principle of synchronous generator. (08 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- If a single phase induction motor runs at a speed lower than the rated one, the most likely defect is,
    - improper size fuses
    - Worn-out bearings or low voltage or over load
    - Open-circuit in the winding
    - Short-circuit in the winding
  - If the starting winding of a single phase induction motor is left in the circuit,
    - the motor will run faster
    - the motor will run slower
    - there will be undue sparking
    - the auxillary winding will get over-heated due to continuous flow of current and may get damaged.
  - Which of the following types of motors are not single phase ac motors?
    - Induction type motors
    - Commutator type motors
    - Synchronous type motors
    - Schrage motors
  - Which of the following types of motors are not the induction motors?
    - Repulsion motors
    - Split phase motors
    - Shaded pole motors
    - Repulsion start induction motors
- b. Explain construction and working principle of star-delta starter. (08 Marks)
- c. What is meant by the slip of the induction motor? Under what circumstances the slip is
- unity and
  - zero. (08 Marks)

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**First/Second Semester B.E. Degree Examination, June/July 2013**  
**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 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) When forward – biased, a diode
 

|                          |                          |
|--------------------------|--------------------------|
| A) blocks current        | B) conducts current      |
| C) has a high resistance | D) drops a large voltage |
  - ii) The knee voltage of a Silicon diode is
 

|          |          |          |                  |
|----------|----------|----------|------------------|
| A) 0.3 V | B) 0.5 V | C) 0.7 V | D) None of these |
|----------|----------|----------|------------------|
  - iii) The ripple factor of half wave rectifier is about \_\_\_\_\_
 

|         |         |         |         |
|---------|---------|---------|---------|
| A) 40.6 | B) 0.46 | C) 1.21 | D) 81.2 |
|---------|---------|---------|---------|
  - iv) The rms value of a load current in case of a full wave rectifier is
 

|                    |                    |                           |                      |
|--------------------|--------------------|---------------------------|----------------------|
| A) $\frac{\pi}{2}$ | B) $\frac{I_m}{2}$ | C) $\frac{I_m}{\sqrt{2}}$ | D) $\frac{I_m}{\pi}$ |
|--------------------|--------------------|---------------------------|----------------------|
- b. Deduce the following for HWR (04 Marks)
- i)  $I_{rms}$     ii)  $I_{dc}$ .
- c. With a neat circuit diagram, explain the working principles of full wave bridge rectifier. (06 Marks)
- d. Draw the circuit of full wave rectifier and show that the ripple factor = 0.48 and efficiency = 81%. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- i) 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) $\beta = \frac{\beta+1}{\beta}$     |
  - ii) The  $\beta_{dc}$  of a transistor is its
 

|                 |                        |
|-----------------|------------------------|
| A) current gain | B) voltage gain        |
| C) power gain   | D) internal resistance |
  - iii) In a transistor the current conduction is due to \_\_\_\_\_ carries.
 

|                     |                  |
|---------------------|------------------|
| A) majority         | B) minority      |
| C) both (A) and (B) | D) None of these |
  - iv) In a transistor circuit,
 

|                |                |                |                  |
|----------------|----------------|----------------|------------------|
| A) $I_E = I_C$ | B) $I_E > I_C$ | C) $I_E < I_C$ | D) $I_E \ll I_C$ |
|----------------|----------------|----------------|------------------|
- b. Draw input and output characteristics of an NPN transistor in common base configuration and explain. (08 Marks)
- c. Calculate the value of  $I_C$ ,  $I_E$  and  $\beta_{dc}$  for a transistor with  $\alpha = 0.99$  and  $I_B = 110 \mu A$ . (04 Marks)
- d. Obtain the relation between ' $\alpha_{dc}$ ' and ' $\beta_{dc}$ '. (04 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- The intersection of a dc load line and the output characteristics of a transistor is called
    - Q – point
    - Quiescent point
    - Operating point
    - All of these
  - For an emitter follower, the voltage gain is
    - unity
    - greater than unity
    - less than unity
    - zero
  - The best biasing stability is achieved by using \_\_\_\_\_ biasing circuit.
    - fixed
    - collector to base
    - voltage divider
    - None of these
  - In self bias or emitter bias circuit \_\_\_\_\_ is connected between emitter and ground
    - inductor
    - capacitor
    - resistor
    - transformer
- b. Explain the concepts of base bias techniques using NPN transistor. (10 Marks)
- c. Calculate the Q – point values for the circuit of collector to base circuit. Given  $R_B = 100 \text{ K}\Omega$ ,  $R_C = 10 \text{ K}\Omega$ ,  $V_{CC} = 12 \text{ V}$  and  $\beta_{dc} = 100$ . (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- A SCR has \_\_\_\_\_ number of layers
    - one
    - two
    - three
    - Four
  - The minimum point in VI characteristic of UJT is known as \_\_\_\_\_ point
    - negative
    - valley
    - latching
    - conducting
  - The FET is a \_\_\_\_\_ controlled device
    - current
    - voltage
    - power
    - None of these
  - The relaxation oscillator uses
    - MOSFET
    - SCR
    - BJT
    - UJT.
- b. Draw two transistor equivalent circuit of SCR. Also plot V – I characteristics and explain various regions of operations. (10 Marks)
- c. Explain with suitable diagram and waveforms, how UJT can be used as a relaxation oscillator. (06 Marks)

## PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Oscillator uses \_\_\_\_\_ type of feedback
    - positive
    - negative
    - both
    - None of these
  - A phase shift oscillator has
    - three RC circuits
    - three LC circuits
    - a T - type circuit
    - a  $\pi$  type circuit
  - The frequency of Hartley oscillator is  $f =$  \_\_\_\_\_
    - $\frac{1}{2\pi\sqrt{LC}}$
    - $\frac{1}{2\pi\sqrt{RC}}$
    - $\frac{1}{2\pi\sqrt{C}}$
    - $\frac{1}{2\pi LC}$
  - The upper and lower critical frequencies are sometimes called the
    - power frequencies
    - half power frequencies
    - 6 dB points
    - None of these
- b. Explain with a neat diagram, the working of single stage RC coupled amplifiers with its frequency response. (08 Marks)
- c. Give any four advantages of negative feedback in amplifier. (04 Marks)
- d. In a colpitts oscillator, if the desired frequency is 800 KHz, determine the values of L and  $C_{eq}$  if  $C_1 = C_2 = 10 \text{ picofarad}$ . (04 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The CMRR is given by \_\_\_\_\_  
 A)  $A_d \times A_c$       B)  $A_c / A_d$       C)  $A_d / A_c$       D)  $20 \log A_c / A_d$
  - The gain of the inverting amplifier using  $R_f = 10 \text{ K}\Omega$  and  $R_1 = 1 \text{ K}\Omega$  is \_\_\_\_\_  
 A) -10      B) -11      C) 10      D) 11
  - The gain of the voltage follower is \_\_\_\_\_  
 A) zero      B) infinite      C) negative      D) unity
  - The screen of CRT is coated with \_\_\_\_\_  
 A) chromium      B) phosphor      C) carbon      D) germanium
- b. Calculate the output voltage of a three input summing amplifier : Given  $R_1 = 200 \text{ K}\Omega$ ,  $R_2 = 250 \text{ K}\Omega$ ,  $R_3 = 500 \text{ K}\Omega$  and  $R_f = 1 \text{ M}\Omega$ ,  $V_1 = -2\text{V}$ ,  $V_2 = 2\text{V}$  and  $V_3 = 1 \text{ V}$ . (06 Marks)
- c. Show, how an op amp can be used as an integrator. Derive an expression for output voltage. (06 Marks)
- d. Give any four applications of CRO. (04 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- The modulating frequency is \_\_\_\_\_ carrier frequency  
 A) lower than      B) higher than      C) equal to      D) None of these
  - The modulation is done in \_\_\_\_\_  
 A) transmitter      B) receiver  
 C) none of the above      D) between transmitter and receiver.
  - The 2's complement of 1010 gives  
 A) 1111      B) 0110      C) 0010      D) 0101
  - In binary numbers, shifting the binary point one place to right  
 A) divides by 2      B) decreases by 10  
 C) increases by 10      D) multiplies by 2
- b. With suitable block diagram, explain the function of superheterodyne receiver. (08 Marks)
- c. Convert  $(ABCD)_{16} = ( )_2 = ( )_8 = ( )_{10} = ( )_{BCD}$ . (04 Marks)
- d. Subtract :  $(28)_{10} - (19)_{10}$  using both 1's complement and 2's complement methods. (04 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- When demorganis theorem applied to  $(A + B)$ , we get \_\_\_\_\_  
 A)  $A + B$       B)  $\bar{A} \bar{B}$       C) A      D) B
  - $Y = \bar{A}B + \bar{B}A$  is a Boolean expression for \_\_\_\_\_  
 A) EX - OR      B) EX - NAND  
 C) EX - NOR      D) none of these
  - The example for universal gate is \_\_\_\_\_  
 A) NOT      B) NOR      C) OR      D) AND
  - The expression for half adder carry 'C' with inputs 'A' and 'B' is given by  
 A)  $A + B$       B)  $AB$       C)  $\bar{A} \bar{B}$       D) none of these
- b. i) Realize the NAND gate using minimum number of NOR gates  
 ii) Simplify  $M = XYZ + X\bar{Y}Z + \bar{X}YZ$  and realize using of NOR gates. (08 Marks)
- c. Realize a full adder using two half adders and an OR gate with truth table. (08 Marks)

\* \* \* \* \*



8. Which of the following does not depict the attitude towards responsibility?  
 a) Protest                      b) Reasonable care                      c) Good works                      d) Minimalist
9. \_\_\_\_\_ is not the symptom of group thinking.  
 a) Illusion of unanimity                      b) Mind guarding                      c) Egocentric tendency                      d) Self - censorship
10. Revealing confidential information means \_\_\_\_\_  
 a) Breach of contract                      b) Criminal breach of trust  
 c) Misusing the truth                      d) Violation of patent right
11. Risk as a maximizing benefit is understood by \_\_\_\_\_  
 a) Risk/benefit analysis                      b) Cost/benefit analysis  
 c) Straight line analysis                      d) Break – even analysis
12. The codes of ethics can be taken as guidelines by the engineers to \_\_\_\_\_  
 a) Overcome the work pressure                      b) Resolve the conflicts  
 c) Formulate the problem                      d) Escape from the responsibility
13. Which writ has been filed against Karunanidhi, Chief Minister of Tamilnadu with regard to his comment on Setu samudram project?  
 a) Prohibition                      b) Certiorari                      c) Quo - Warranto                      d) No such writ filed
14. Who is the first Chief Justice of India?  
 a) Harlal .J. Kania                      b) B.K. Mukherjee                      c) Patanjali Sasthri                      d) S.R. Das
15. During the discussions in Parliament, 'Guillotine' applies to \_\_\_\_\_  
 a) Demands for Grants                      b) Finance bills                      c) Vote on account                      d) Appropriation Bill
16. Sarkaria Commission was appointed by the Government to report on \_\_\_\_\_  
 a) Electoral reforms                      b) Inter – state relations  
 c) Centre – State relations                      d) Tribal Development
17. One of the following is not included in the right to personal liberty  
 a) Right to equality of wages                      b) Right to free legal-aid  
 c) Right not to be tortured                      d) Freedom from arrest
18. Every citizen of India has a right to contest any election unless disqualified. The right to contest election is  
 a) A Fundamental right                      b) An ordinary civil right  
 c) A Fundamental duty                      d) An important constitutional right
19. A law making classification on the basis of place of residence is \_\_\_\_\_  
 a) Violative of Article - 15  
 b) Not violative of Article – 15  
 c) Violative of Article – 15, read with Article -14  
 d) Violative of Article – 15, read with Article – 14 and Article – 16(1).
20. Article -20-22 relate to the fundamental right to life and personal liberty. These rights are available to \_\_\_\_\_  
 a) Citizen only                      b) Citizens and non – citizens  
 c) Natural persons as well as artificial persons                      d) All persons who have juristic personality
21. The Fundamental rights are \_\_\_\_\_  
 a) Not enforceable                      b) Not justiciable  
 c) Both justiciable and enforceable                      d) Unamendable

22. Article-14 guarantees equality before law and equal protection of laws to \_\_\_\_  
 a) All the persons living within the territories of India  
 b) All Indian citizens living in India  
 c) Any person domiciled in India  
 d) All persons natural as well as artificial
23. Doctrine of self – incrimination enacted in Article 20(3) means that \_\_\_\_  
 a) No citizen accused of an offence can be compelled to be a witness against himself  
 b) No person accused of an offence can be compelled to be lead evidence against himself  
 c) No person accused of an offence can be compelled to be a witness against himself  
 d) No person accused of an offence can give evidence against himself
24. Article – 18 of constitution, prohibits the Indian citizen from accepting\_\_\_\_  
 a) Bribe                      b) Gift                      c) Any title from Foreign state                      d) All of the above
25. Article – 24 of Constitution prevents one of the following  
 a) Child labour                      b) Traffic in human beings  
 c) Transporting goods                      d) Sale of goods
26. The Directive Principle of State Policy are\_\_\_\_  
 a) Nonjusticiable                      b) Sometime justiciable                      c) Always justiciable                      d) justiciable
27. The powers of the High Court is vast when compared to the powers of the Supreme Court with regard to entertaining writs\_\_\_\_  
 a) True                      b) False                      c) Partially true                      d) Partially false
28. The ideals of liberty, equality and fraternity enshrined in the Preamble of the Constitution were adopted under inspiration from \_\_\_\_  
 a) The Russian Revolution                      b) The French Revolution  
 c) The American Declaration of Independence                      d) The UN Charter
29. Traffic in Human beings means\_\_\_\_  
 a) Vehicular traffic                      b) Transportation of human beings  
 c) Illegal sale of Human organs                      d) None of these
30. The Indian Constitution is silent as to which of the following Directive principles of State Policy?  
 a) Free legal aid to poor                      b) Equal pay for equal work  
 c) Adult Education                      d) Improving the standard of living of workers.
31. The Indian Union Legislature is known as\_\_\_\_  
 a) Congress                      b) Federal Assembly                      c) Parliament                      d) Diet.
32. Which amendment to the Indian Constitution is called as the Mini Constitution?  
 a) 86                      b) 73                      c) 42                      d) 74
33. Writ of prohibition cannot be issued against the  
 a) Judicial functions                      b) Quasi Judicial functions  
 c) Legislative functions                      d) Acts of lower courts.
34. Which one of the following is included in Freedom of Trade and Commerce?  
 a) Business in intoxicants                      b) Business in adulterated food stuffs  
 c) Business in prize competitions                      d) Business in medicinal drugs
35. Untouchability is associated with \_\_\_\_ inequality.  
 a) Religious                      b) Social                      c) Political                      d) Cultural.





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Question Paper Version : D

**First/Second Semester B.E Degree Examination, June/July 2013**

**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. The major environmental impact of agriculture is
    - a) conversion of forest land to crop land
    - b) conversion of grass – land to crop land
    - c) planting trees in crop land
    - d) both (a) & (b)
  2. Organic farming is a farming without
    - a) synthetic fertilizers
    - b) pesticides
    - c) green manures
    - d) both (a) & (b)
  3. Secondary sector of industries consumes large amount of
    - a) fertilizers
    - b) raw materials
    - c) land
    - d) none of these
  4. Gold occurs in
    - a) sedimentary deposits
    - b) placer deposits
    - c) hydrothermal deposits
    - d) none of these
  5. Service industry includes
    - a) insurance
    - b) education
    - c) health care
    - d) all of these
  6. Advantage of road transport system is
    - a) cost of vehicles is relatively less
    - b) high relative speed of vehicles
    - c) easily available in markets
    - d) both (a) & (b)
  7. Indirect environmental effects of widespread use of automobiles are
    - a) urban sprawl
    - b) paving of vast areas of watershed
    - c) alteration of runoff patterns
    - d) all of these
  8. EIA is used to
    - a) establishing the environmental base line data
    - b) impact identification
    - c) (a) & (b)
    - d) to identify alternate industries

9. Sustainability requires
- conservation of resources
  - minimizing depletion of non-renewable resources
  - using sustainable practices for managing renewable resources
  - all of these
10. Solar energy is called \_\_\_\_\_ source of energy
- renewable
  - continuous
  - non-renewable
  - none of these
11. The rate of sustainable use of a renewable resource is determined by
- replacement rate
  - amounts of standing stock
  - (a) & (b)
  - none of these
12. Which of the following statement about forest is in-correct?
- provides recreational opportunities
  - provides a source of economic development
  - reduces soil erosion
  - none of these
13. Water plays key role in the evaluation of
- earth's ecosystems
  - moderate climate
  - none of these
  - (a) & (b)
14. What is the percentage of fresh water available in lakes and streams?
- 0.04
  - 0.01
  - 0.25
  - 0.1
15. Water quality is depending on
- biological characteristics
  - aesthetic characteristics
  - physical
  - all of these
16. In the primary treatment, aeration of water is done to
- decrease the oxygen content
  - remove solids
  - remove iron & manganese
  - none of these
17. Disinfection of water is done to destroy
- pathogens & bacteria
  - organic matter
  - chloro-organics
  - none of these
18. Malaria is a
- water borne disease
  - water induced disease
  - (a) & (b)
  - none of these
19. Fluoride concentration of more than 1.5mg/L in drinking water causes
- dental fluorosis
  - dental caries
  - blue baby disease
  - none of these
20. Mineral is a
- organic matter
  - naturally occurring inorganic substance
  - synthetic compound
  - none of these
21. Ore deposits enclosed in a rock is called
- host rock
  - deposit rock
  - secondary deposit rock
  - none of these
22. Thorium oxide is available in
- Kerala
  - Orissa
  - Tamilnadu
  - All of these

23. One joule of energy is equal to  
 a) 0.2389 calories      b) 23.89 calories      c) 238.9 calories      d) 2.389 calories
24. Radiated energy can be transferred in  
 a) medium of air      b) free space      c) solid medium      d) (a) & (b)
25. Hydro-electric energy generation causes environmental problem such as  
 a) earthquake      b) habitat loss      c) deforestation      d) all of these
26. Which solar system can be used to achieve temperature of  $1000^{\circ}\text{C}$ ?  
 a) flat plate collector      b) parabolic dish collectors  
 c) parabolic through collector      d) none of these
27. Heating of coal, in absence of air to produce coal gas is called  
 a) carbonization of coal      b) coal gasification  
 c) coal liquefaction      d) none of these
28. One gram of Uranium U235 can give electrical energy equivalent to  
 a) 100MW      b) 1000KW      c) 1MW      d) 1000MW
29. Hydrogen can be produced commercially by  
 a) cracking of ammonia      b) electrolysis of water  
 c) (a) & (b)      d) gasification
30. Temporary hardness of water is due to  
 a) chloride hardness      b) manganese hardness  
 c) calcium hardness      d) carbonate hardness
31. Nitrate concentration more than 45mg/L leads to a disease called  
 a) gastroenteritis      b) methenoglobenemia      c) typhoid      d) none of these
32. In water treatment, alum is used for  
 a) aeration      b) coagulation      c) filtration      d) disinfection
33. The process of decomposing organic waste in the presence of air is called  
 a) reduction      b) oxidation      c) incineration      d) pulverizing
34. The organ of a baby usually damaged from lead poisoning  
 a) kidney      b) lungs      c) lever      d) heart
35. Atmospheric pollutants are largely present in  
 a) troposphere      b) stratosphere      c) mesosphere      d) all of these
36. Which of the following is a source of benzpyrene?  
 a) charcoal      b) gasoline exhausts      c) tobacco      d) all of these
37. Main components of smog are  
 a) unsaturated hydrocarbons      b)  $\text{NO}_x$   
 c) Sulphur compound      d) All of these
38. Petroleum based vehicles emit  
 a) polynuclear hydrocarbons      b) CO  
 c) aldehydes      d) All of these



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**Second Semester B.E. Degree Examination, June/July 2013**

**Engineering Mathematics – II**

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)
- i) A differential equation of the first order but of higher degree, solvable for y, has the solution as  
 A)  $F(x, y, c) = 0$  B)  $F(x, c_1, c_2) = 0$   
 C)  $F(x, p, c) = 0$  D)  $F_1(x, y, c).F_2(x, y, c) = 0$
- ii) If  $c^2x^2 + 1 = 2cy$  is the general solution of a differential equation then its singular solution is  
 A)  $y = x$  B)  $y = -x$  C) both (A) and (B) D) none of these
- iii) The general solution of the differential equation  $p = \log(px - y)$  is  
 A)  $y = px + e^p$  B)  $y = px - e^p$  C)  $y = px - e^c$  D)  $y = cx - e^c$
- iv) The differential equation  $xp^2 + x = 2yp$  can be solvable for  
 A) p B) y C) x D) all of these
- b. Solve  $xyp^2 + p(3x^2 - 2y^2) - 6xy = 0$ . (05 Marks)
- c. Solve  $y = p \sin p + \cos p$ . (05 Marks)
- d. Solve  $y^2 \log y = xyp + p^2$ . (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- i)  $\frac{1}{f(D)}(e^{3x}x^2) =$   
 A)  $e^{3x} \frac{1}{f(D-3)}x^2$  B)  $e^{3x} \frac{1}{f(D+3)}x^2$  C)  $x^2 \frac{1}{f(D-3)}e^{3x}$  D)  $x^2 \frac{1}{f(D+3)}e^{3x}$
- ii) The roots of auxillary equation of  $(D^4 + 2D^3 - 5D^2 - 6D)y = 0$  are  
 A) -1, -1, 2, -3 B) 0, -1, 2, -3 C) 0, 1, -2, 3 D) 0, -1, 2, 3
- iii) The particular integral of  $(-D + 2)^3y = 3e^{2x}$  is  
 A)  $\frac{x^3e^{2x}}{3}$  B)  $\frac{x^3e^{2x}}{2}$  C)  $-\frac{x^3e^{2x}}{2}$  D)  $-\frac{x^3e^{2x}}{6}$
- iv) If  $\frac{dx}{dt} - 2y = 0$ ,  $\frac{dy}{dt} - 2x = 0$  then y is a function of  
 A)  $e^{2t}$  and  $e^{-2t}$  B)  $e^{2it}$  and  $e^{-2it}$  C)  $e^t$  and  $e^{-2t}$  D) none of these
- b. Solve  $(D^3 - 6D^2 + 11D - 6)y = 2^x + \cos 2x$ . (05 Marks)
- c. Solve  $(D^2 - 4D + 4)y = 8x^2e^{2x} \sin 2x$ . (05 Marks)
- d. Solve  $\frac{dx}{dt} + \frac{dy}{dt} + 2x + y = 0$ ,  $\frac{dy}{dt} + 5x + 3y = 0$ . (06 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- i) The complementary function of  $x^2y'' + 4xy' + 2y = e^x$  is  
 A)  $c_1e^{-x} + c_2e^{-2x}$     B)  $c_1(-x) + c_2(-2x)$     C)  $c_1e^{-2} + c_2e^{2z}$     D)  $\frac{c_1}{x} + \frac{c_2}{x^2}$
- ii) If  $y = u(x) \cdot 1 + v(x) \cdot e^{2x}$  is a particular integral of  $y'' + y = \operatorname{cosec} x$  in the method of variation of parameters then  $v(x) =$   
 A)  $e^{-x}$     B)  $e^{-2x}$     C)  $e^{2x}$     D)  $-e^{-x}$
- iii) The roots of the auxillary equation of the transformed equation of :  
 $(2x + 1)^2 y'' - 2(2x + 1)y' - 12y = 6x + 5$  are  
 A) 3, -1    B) -3, 1    C) 12, -4    D) none of these
- iv) Indicial equation is related to  
 A) singular point    B) regular singular point  
 C) ordinary point    D) none of these
- b. Solve  $(D^2 + 1)y = \tan x$  by method of variation of parameters. (05 Marks)
- c. Solve  $x^2y'' - xy' + 2y = x \sin(\log x)$ . (05 Marks)
- d. Solve  $(1 + x^2)y'' + xy' - y = 0$  in series solution. (06 Marks)

- 4 a. Choose the correct answers for the following : (04 Marks)
- i)  $z = (x - a)^2 + (y - b)^2$ ,  $a$  and  $b$  are arbitrary constants, is a solution of  
 A)  $z = 2p^2 + 2q^2$     B)  $4z = p^2 + q^2$     C)  $p = 2(x - a)$     D)  $q = 2(y - b)$
- ii) For  $z = (x + a)(x + b)$ ,  $z = 0$  is a  
 A) singular solution    B) general solution  
 C) particular solution    D) complete solution
- iii) Suitable set of multipliers to solve  $(y^2 + z^2)p + xyq = zx$ .  
 A) 0, 1, 1    B)  $x, -y, -z$     C)  $1, -\frac{y}{x}, -\frac{z}{x}$     D) all of these
- iv) Taking  $Z = X(x) \cdot Y(y)$  is a solution of a partial differential equation then this procedure is called  
 A) separation of derivatives    B) Lagrange's method  
 C) separation of variables    D) Partial separation of variables
- b. Form a partial differential equation by eliminating arbitrary function from the relation  
 $z = f\left(\frac{xy}{z}\right)$ . (05 Marks)
- c. Solve  $xp - yq = y^2 - x^2$ . (05 Marks)
- d. Solve  $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$  by the method of separation of variables. (06 Marks)

### PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i)  $\int_0^1 \int_0^{1-y} (x^2 - y^2) dx dy =$   
 A) 0    B)  $\frac{1}{12}$     C)  $\frac{1}{6}$     D) none of these



7 a. Choose the correct answers for the following :

(04 Marks)

i)  $L(2 \cosh 2t) =$

A)  $\frac{4}{s^2 - 4}$

B)  $\frac{4s}{s^2 - 4}$

C)  $\frac{2s}{s^2 - 4}$

D) none of these

ii)  $L\left(\frac{\sin t}{t}\right) =$

A)  $\cot^{-1} s$

B)  $\frac{1}{s^2 + 1}$

C)  $\tan^{-1} s$

D)  $\cot^{-1}(s - 1)$

iii)  $L(f'(t)) =$

A)  $s f(t) - f(0)$

B)  $s f'(s) - f(0)$

C)  $f(s) - f(0)$

D) none of these

iv)  $L(\sin 2t \cdot \delta(t - 2)) =$

A)  $e^{2s} \sin 4$

B)  $e^{-2s} \sin 2$

C)  $e^{-4s} \sin 2$

D)  $e^{-2s} \sin 4$

b. Prove that  $L(t^n) = \frac{n!}{s^{n+1}}$  if  $n$  is a positive integer.

(05 Marks)

c. Find  $L\left(\frac{e^{-t} \sin t}{t}\right)$  and hence find  $\int_0^{\infty} \frac{e^{-t} \sin t}{t} dt$ .

(05 Marks)

d. Express :  $f(t) = t - 1, 1 < t < 2$   
 $= -t - 3, 2 < t < 3$   
 $= 0, \text{ otherwise}$

in terms of unit step function and hence find  $L(f(t))$ .

(06 Marks)

8 a. Choose the correct answers for the following :

(04 Marks)

i)  $L^{-1}(s^{-5/2}) =$

A)  $\frac{2t^{3/2}}{\sqrt{\pi}}$

B)  $\frac{4t^{3/2}}{3\sqrt{\pi}}$

C)  $\frac{8t^{3/2}}{15\sqrt{\pi}}$

D) none of these

ii)  $L^{-1}(\bar{f}(s) \cdot \bar{g}(s)) =$

A)  $f(t) \cdot g(t)$

B)  $\int_0^t f(u)g(t-u)du$

C)  $\int_0^t f(t-u)g(u)du$

D) either (B) or (C)

iii)  $L^{-1}\left(\frac{1}{s^2 + 5}\right) =$

A)  $\frac{1}{5} \sin \sqrt{t}$

B)  $\frac{1}{\sqrt{5}} \sin \sqrt{5t}$

C)  $\frac{1}{\sqrt{5}} \sin \sqrt{5} t$

D)  $\sin \sqrt{5} t$

iv)  $L^{-1}\left(\int_s^{\infty} F(s) ds\right) =$

A)  $t f(t)$

B)  $\frac{f(t)}{t}$

C)  $\frac{f(s)}{s}$

D) none of these

b. Find  $L^{-1}\left\{\log \frac{s+1}{s-1}\right\}$ .

(05 Marks)

c. Find  $L^{-1}\left[\frac{1}{4s^2 - 9}\right]$  by using convolution theorem.

(05 Marks)

d. Solve by using Laplace transformation  $y''' + 2y'' - y' - 2y = 0$  where  $y = 1, \frac{dy}{dt} = 2 = \frac{d^2y}{dt^2}$  at  $t = 0$ .

(06 Marks)

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