

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 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 :
- i) The Leibnitz theorem is the formula to find the n^{th} derivative of
 A) trigonometric function B) exponential function C) product of two algebraic functions D) product of two functions
 - ii) The n^{th} derivative of 5^x is : A) $\log 5, 5^x$ B) $(\log 5)^n 5^x$ C) $e^{(\log 5)^x}$ D) $(\log 5)^2 e^{(\log 5)^x}$
 - iii) The value of 'c' of the Cauchy mean value theorem for $f(x) = e^x, g(x) = e^{-x}$ in (3, 7) is : A) 5 B) 3 C) 0 D) 4
 - iv) The generalized series of Maclaurin's series expansion is
 A) Taylor series B) Exponential series C) Logarithmic series D) Trigonometric series (04 Marks)
- b. Verify Rolle's theorem for the function $f(x) = x^2(1-x)^2$ in $0 \leq x \leq 1$ and also find the value of c. (04 Marks)
- c. If $\sin^{-1} y = 2 \log(x+1)$, prove that $(x+1)^2 y_{n+2} + (2n+1)(x+1)y_{n+1} + (n^2+4)y_n = 0$. (06 Marks)
- d. Expand by using Maclaurin's series, the function $\log(1+\sin x)$ upto fifth degree terms. (06 Marks)
- 2 a. Choose the correct answers for the following :
- i) The curve $r = \frac{a}{1+\cos\theta}$ intersect orthogonally with the following curve : A) $r = \frac{b}{1-\cos\theta}$ B) $r = \frac{c}{1+\sin\theta}$ C) $r = \frac{b}{1-\sin\theta}$ D) $r = \frac{d}{\cos\theta}$
 - ii) If ϕ be the angle between the tangent and radius vector at any point on the curve $r = f(\theta)$, then $\sin \phi$ equals to
 A) $\frac{dr}{ds}$ B) $r \frac{d\theta}{ds}$ C) $r \frac{d\theta}{dr}$ D) $r \frac{dr}{d\theta}$
 - iii) L Hospital's Rule can be applied to the limits of the form : A) $0/0$ B) $0 \times \infty$ C) $\infty - \infty$ D) ∞^0
 - iv) $\lim_{x \rightarrow \infty} (a^{1/x} - 1)x$ is of the following form : A) $0 \times \infty$ B) $\infty - \infty$ C) ∞^0 D) 0^∞ (04 Marks)
- b. Evaluate $\lim_{x \rightarrow \pi/2} (\tan x)^{\cos x}$. (04 Marks)
- c. Find the radius of curvature for the curve $x^2 y = a(x^2 + y^2)$ at the point $(-2a, 2a)$. (06 Marks)
- d. Find the Pedal equation for the curve $r(1 - \cos \theta) = 2a$. (06 Marks)
- 3 a. Choose the correct answers for the following :
- i) If $f(x, y) = \frac{1}{x^3} + \frac{1}{y^3} + \frac{1}{x^3 + y^3}$, then $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y}$ is : A) 0 B) 9 C) 1 D) -3f
 - ii) If $x = \rho \cos \theta, y = \rho \sin \theta, z = z$ then $\frac{\partial(x, y, z)}{\partial(\rho, \theta, z)}$: A) ρ B) 1 C) 0 D) θ
 - iii) If an error of 1% is made in measuring its base and height, the percentage error in the area of a triangle is
 A) 0.2% B) 0.02% C) 1% D) 2%
 - iv) One of the necessary and sufficient condition for a function to have a maximum value is
 A) $AC - B^2 > 0, A < 0$ B) $AC - B^2 = 0, A = 0$ C) $AC - B^2 < 0, A > 0$ D) $AC - B^2 > 0, A > 0$ (04 Marks)
- b. If $V = e^{a\theta} \cos(a \log r)$, prove that $\frac{\partial^2 V}{\partial r^2} + \frac{1}{r} \frac{\partial V}{\partial r} + \frac{1}{r^2} \frac{\partial^2 V}{\partial \theta^2} = 0$. (06 Marks)
- c. Examine the function $f(x, y) = 1 + \sin(x^2 + y^2)$ for extremum values. (05 Marks)
- d. In calculating the volume of right circular cone, errors of 2% and 1% are made in height and radius of the base respectively. Find the percentage error in the volume. (05 Marks)
- 4 a. Choose the correct answers for the following :
- i) If $\vec{F} = \nabla \phi$, then the curl \vec{F} : A) solenoidal B) irrotational C) rotational D) none of these
 - ii) If $V = x^2 + y^2 + 3$ then grad V is : A) $2xi + 2yj$ B) $2x + 2y$ C) $2xi + 2yj + k$ D) $xi + yj$
 - iii) The value of 'a' of the vector $\vec{F} = (x + 3y)i + (x - 2z)j + (x + az)k$, which is solenoidal : A) -2 B) -1 C) 0 D) 3
 - iv) If $R = x^2 y + y^2 z + z^2 x$, then Laplacian of R is : A) $x + y + z$ B) $x - y - z$ C) $2(x + y + z)$ D) $2(x - y + z)$ (04 Marks)
- b. Find div \vec{F} and curl \vec{F} , where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. (06 Marks)
- c. Prove that $\text{curl}(\phi \vec{u}) = \phi \text{curl} \vec{u} + \text{grad} \phi \times \vec{u}$. (06 Marks)
- d. Show that the cylindrical system is orthogonal. (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following :
- i) The value of $\int_0^{\pi/2} \cos x \sin^{99} x \, dx$ is A) 1/99 B) 1/100 C) $\pi/100$ D) $99/100$

- ii) The curve $y^2(a^2 + x^2) = x^2(a^2 - x^2)$ is
 A) symmetric about the x-axis B) symmetric about the x & y axis C) symmetric about the y-axis D) none of these

- iii) The length of the arc $y = f(x)$ from $x = a$ to $x = b$ is

A) $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$ B) $\int_a^b \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dx$ C) $\int_a^b \sqrt{1 + \left(\frac{dx}{dy}\right)^2 + \left(\frac{dy}{dx}\right)^2} dx$ D) none of these

- iv) The value of $\int_0^\pi \sin^4 x dx$ is equal to : A) $3\pi/8$ B) $3/8$ C) $\pi/16$ D) $\pi/4$ (04 Marks)

- b. Obtain the reduction formula for $\int \sin^n x dx$. (04 Marks)

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

- d. Find the area of an arch of the cycloid $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$. (06 Marks)

- 6 a. Choose the correct answers for the following :

- i) The order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^2 = c \frac{d^2y}{dx^2}$ respectively is

A) one, two B) one, one C) two, one D) three, two

- ii) The differential equation $\left[1 + e^{x/y}\right]dx + e^{x/y}\left[1 - \frac{x}{y}\right]dy = 0$ is

A) homogeneous and linear B) homogeneous and exact C) non-homogeneous and exact D) none of these

- iii) The solution of the differential equation $\frac{dy}{dx} = e^{x+y}$: A) $e^x + e^y = c$ B) $e^x + e^y = c$ C) $e^x - e^y = c$ D) $e^{x+y} = c$

- iv) Replacing dy/dx by $-dx/dy$ in the differential equation of $(x, y, dy/dx) = 0$, we get the differential equation of

A) polar trajectory B) orthogonal trajectory C) trajectory D) none of these (04 Marks)

- b. Solve $\frac{dy}{dx} = \frac{2x - y + 1}{x + 2y - 3}$. (06 Marks)

- c. Solve $dr + (2r \cot \theta + \sin 2\theta)d\theta = 0$. (06 Marks)

- d. Find the orthogonal trajectory of the family of coaxial circles $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1$. (04 Marks)

- 7 a. Choose the correct answers for the following :

- i) The normal form of the matrix are A) $[I_3, 0]$ B) $\begin{bmatrix} 1^2 \\ 0 \end{bmatrix}$ C) $\begin{bmatrix} I_3 & 0 \\ 0 & 0 \end{bmatrix}$ D) all of these

- ii) The solution of the simultaneous equations $x + y = 3$, $x - y = 3$ is

A) only trivial B) only unique C) unique and trivial D) none of these

- iii) In Gauss Jordan method, the coefficient matrix reduces to matrix

A) diagonal B) unit matrix C) triangular matrix D) none of these

- iv) If r is the rank of the matrix $[A]$ of order $m \times n$ then r is : A) $r \leq m$ B) $r \leq n$ C) $r \geq n$ D) $r \geq m$ (04 Marks)

- b. Find the rank of the following matrix by elementary transform: $A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$ (04 Marks)

- c. Find for what value of k the system of equations $x + y + z = 1$, $x + 2y + 4z = k$, $x + 4y + 6z = k^2$, posses a solution. Solve completely in each case. (06 Marks)

- d. Solve the following system of equations by Gauss elimination method: $x + y + z = 9$; $x - 2y + 3z = 8$; $2x + y - z = 3$ (06 Marks)

- 8 a. Choose the correct answers for the following :

- i) If the determinant of the coefficient matrix is zero, then there exist

A) trivial solution B) non-trivial solution C) unique solution D) no solution

- ii) If P is the modal matrix of an orthogonal matrix, then its inverse matrix is equal to

A) P^{-1} B) P C) diagonal matrix D) none of these

- iii) The quadratic form for the matrix $A = \begin{bmatrix} a & h \\ h & b \end{bmatrix}$ is : A) $ax^2 + 2hxy + by^2$ B) $ax^2 + by^2$ C) $ax^2 + 2bxy + 2by^2$ D) none of these

- iii) The nature of the quadratic function of the matrix having the eigen values $[0, 2, 4]$ is

A) positive definite B) positive semi-definite C) negative definite D) negative semi-definite (04 Marks)

- b. Reduce the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ to the diagonal form and hence find A^{-1} . (06 Marks)

- c. Find all the eigen values of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (04 Marks)

- d. Reduce the quadratic form $3x^2 + 3y^2 + 3z^2 + 2xy - 2yz + 2zx$ into canonical form. (06 Marks)

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First/Second Semester B.E. Degree Examination, January 2013
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)
- When the concentration of chloride ion in calomel increases, the reduction potential of the electrode.
 A) Increases B) Decreases C) Will not alter D) None of these
 - Electrode potential of a metal electrode in dilute solution is
 A) Same as in concentrated solution B) Higher than that in concentrated solution
 C) Lower than that in concentrated solution D) Cannot be predicted
 - When current is drawn from the Daniel cell, potential at cathode
 A) Increases B) Decreases C) Remains constant D) Becomes zero
 - In a concentration cell, the electrode in contact with a solution of higher concentration acts as
 A) Anode B) Cathode C) Both anode and cathode D) None of these
- b.** Define single electrode potential. Derive Nernst equation for single electrode potential. (07 Marks)
- c.** What are Reference electrodes? Explain the construction and working of calomel electrode? (06 Marks)
- d.** Calculate emf of the following cell $\text{Fe}/\text{Fe}^{2+} (0.013\text{M})//\text{Ag}^+(0.15\text{M})/\text{Ag}$ at STP, if the standard electrode potentials of iron and silver electrodes are -0.44V and 0.80V respectively. (03 Marks)
- 2 a.** Choose the correct answers for the following: (04 Marks)
- In which of the following the net cell reaction is irreversible
 A) Dry cell B) Lead-Acid battery C) Nicad battery D) Lithium ion battery
 - During discharging of lead-acid battery, the concentration of sulphuric acid
 A) Increases B) Decreases C) Becomes zero D) Remains constant
 - Super capacitor stores
 A) Electrical energy B) Chemical energy
 C) Heat energy D) Both chemical and electrical energy
 - In a fuel cell, electricity is produced by
 A) Combustion B) Electrolysis C) Knocking D) None of these
- b.** Explain the construction and working of acid storage battery. (07 Marks)
- c.** Explain the working of lithium ion battery. Write the advantages of li battery. (06 Marks)
- d.** Mention any three advantages of fuel cell. (03 Marks)
- 3 a.** Choose the correct answers for the following : (04 Marks)
- The reaction that takes place during corrosion of a metal is
 A) Reduction B) Redox C) Oxidation D) Precipitation
 - Corrosion of steel boiler along the riveted portions is an example of
 A) Differential metal corrosion B) Differential aeration corrosion
 C) Stress corrosion D) Grain boundary corrosion
 - During electrochemical corrosion in a deaerated acidic medium
 A) Oxygen is evolved at anode B) Oxygen is reduced at anode
 C) Hydrogen is evolved at cathode D) Hydrogen is oxidized at cathode
 - Galvanizing is an example of
 A) Cathodic metal coating B) Anodizing
 C) Anodic metal coating D) None of these
- b.** Define the term corrosion. Explain the electrochemical theory of corrosion with respect to iron. (07 Marks)
- c.** What is cathodic protection? How a metal is cathodically protected by sacrificial anode method. (06 Marks)
- d.** Write a note on galvanization. (03 Marks)
- 4 a.** Choose the correct answers for the following: (04 Marks)
- In electroplating process, the overvoltage depends on
 A) Temperature B) Current density C) Electrolyte D) All the above
 - The anode used in electroplating of chromium is
 A) Chromium B) Copper C) Graphite D) Pb-Sb
 - Which of the following is essential in electroless plating?
 A) Oxidizing agent B) Complexing agent C) Buffering agent D) Reducing agent
 - In electroplating, throwing power is said to be good if the deposit is
 A) Fast B) Slow C) Thick D) Uniform
- b.** Define the term metal finishing. Mention any three technological importance of metal finishing. (05 Marks)

- c. Explain the process of electroplating of chromium. (05 Marks)
 d. What is electroless plating? Explain the electroless plating of nickel. (06 Marks)

PART – B

- 5 a. Choose the correct answers for the following: (04 Marks)
- If its GCV and NCV are equal, the fuel has

A) No hydrogen content	B) Low hydrogen content
C) High hydrogen content	D) High carbon content
 - The knocking characteristics of petrol is expressed in terms of

A) Octane number	B) Cetane number	C) Calorific value	D) Power number
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 - Photovoltaic cell is

A) Energy conversion device	B) Storage cell
C) Rechargeable cell	D) Fuel cell
 - Synthesis of biodiesel involves

A) Transesterification	B) Hydrolysis	C) Redox reaction	D) Condensation
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- b. Define the term fuel. Explain the determination of calorific value of solid fuel. (07 Marks)
 c. Define the term octane number. Describe any two methods of improving the octane number. (06 Marks)
 d. What are photovoltaic cells? List out its advantages. (03 Marks)
- 6 a. Choose the correct answers for the following: (04 Marks)
- Gibb's phase rule is applicable to

A) Heterogeneous systems	B) Heterogeneous systems in equilibrium
C) Homogeneous systems	D) All of these
 - The phases in equilibrium along the freezing line in phase diagram for water system is

A) Water and vapour	B) Water and Ice	C) Vapour and Ice	D) Only Ice.
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 - The conductometric cell consists of

A) Platinum electrode and calomel electrode	B) Two platinum electrodes kept at 1cm ² area and 1cm apart
C) Glass electrode and standard hydrogen electrode	D) Platinum electrode and glass electrode.
 - In a flame photometer, the light emitted is in

A) IR region	B) Visible region	C) UV region	D) All of these
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- b. State Gibb's phase rule. Draw and explain the phase diagrams of water. (07 Marks)
 c. State Beer's law and Lambert's law. (04 Marks)
 d. Draw and explain the conductometric titration for
 - Strong acid with strong base;
 - Strong acid and weak base. (05 Marks)
- 7 a. Choose the correct answers for the following: (04 Marks)
- Polymethyl methacrylate is commercially called

A) Teflon	B) Bakelite	C) Plexiglass	D) Araldite
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 - Which of the following is an adhesive?

A) Neoprene	B) Buna-S	C) Epoxy resin	D) Polystyrene
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 - Below its glass transition temperature, a polymer is

A) Viscofluid	B) Soft and rubbery	C) Hard and brittle	D) Soft and brittle
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 - Polymer composites consists of

A) Matrix and plasticizer	B) Fibre and plasticizes	C) Fibre and matrix	D) None of these
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- b. Explain the mechanism of addition polymerization with respect to ethylene. (06 Marks)
 c. Explain the term glass transition temperature. Mention the factors that influence the T_g. (05 Marks)
 d. Describe the manufacture of the following polymers: i) Teflon ; ii) Bakelite. (05 Marks)
- 8 a. Choose the correct answers for the following: (04 Marks)
- Alkalinity in water is not due to

A) Hydroxyl ions	B) Carbonate ions	C) Bicarbonate ions	D) Hydrogen ions
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 - COD of waste water is expressed in

A) ppm of oxygen	B) ppm of CaCO ₃	C) mg of CaCO ₃	D) mg of oxygen per liter
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 - Desalination is

A) Removal of hardness from water	B) Addition of salts to water
C) Destruction of salts in water	D) Removal of salts from water
 - The reagent used in colorimetric estimation of nitrate in water is

A) Zr-SPADNA	B) Ammonia
C) Barium chloride	D) Phenol disulphonic acid
- b. Explain the determination of hardness by complexometric method. (06 Marks)
 c. Define BOD and COD. Why COD is always greater than BOD? (05 Marks)
 d. Explain reverse osmosis process. (05 Marks)

First/Second Semester B.E. Degree Examination, January 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 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, $h = 6.625 \times 10^{-34}$ JS, Electron charge, $e = 1.602 \times 10^{-19}$ C, Mass of Electron, $m = 9.11 \times 10^{-31}$ kg, Avogadro 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)
- The law which failed to account for shorter wavelength region of black body radiation spectrum is,
A) Wein's law B) Rayleigh-Jean's law C) Planck's law D) Maxwell's law
 - The de-Broglie wavelength of a particle at rest is
A) Zero B) infinite C) h/p D) h/v
 - If group velocity of particle is 4.7×10^6 m/s then its phase velocity is,
A) 6×10^9 m/s B) 4.7×10^6 m/s C) 9.4×10^6 m/s D) 1.91×10^{10} m/s
 - The particle velocity of wave is equal to,
A) group velocity B) phase velocity C) velocity of light D) velocity of sound
- b. Describe Davisson and Germer experiment for confirmation of de-Broglie hypothesis. (07 Marks)
- c. Derive de-Broglie wavelength using group velocity. (05 Marks)
- d. Calculate the de-Broglie wavelength of particle of mass $0.65 \text{ MeV}/c^2$ has a kinetic energy 80 eV. (04 Marks)
- 2** a. Choose the correct answers for the following : (04 Marks)
- In quantum mechanics the energy operation is represented as:
A) $\frac{8\pi^2 m}{h^2} \frac{\partial^2}{\partial x^2}$ B) $-\frac{h^2}{4\pi^2 m} \frac{\partial^2}{\partial x^2}$ C) $-\frac{h^2}{8\pi^2 m} \frac{\partial^2}{\partial x^2}$ D) $\frac{h^2}{2\pi^2 m} \frac{\partial^2}{\partial x^2}$
 - The probability of finding the particle within an element of volume $d\tau$ is,
A) zero B) $\int |\psi|^2 d\tau$ C) $\int |\psi| d\tau$ D) $\int |\psi^*| d\tau$
 - If an electron moves in one dimensional box of length 2 nm, the normalization constant is,
A) $1(\text{nm})^{-1/2}$ B) $2(\text{nm})^{-1}$ C) $\sqrt{2}(\text{nm})^{-1}$ D) zero
 - The energy of a particle E_n in one-dimensional potential box of width L and infinite height is,
A) $nh / 8mL^2$ B) $nh / 8 mL$ C) $n^2 h^2 / mL^2$ D) $n^2 h^2 / 8 mL^2$
- b. Set up Schrodinger's time-independent wave equation. (08 Marks)
- c. Using uncertainty principle, prove that free electron does not exist inside the nucleus. (04 Marks)
- d. A spectral line of wavelength 4000 \AA has width of $8 \times 10^{-5} \text{ \AA}$. Evaluate the minimum time spent by electrons in upper energy state between excitation and de-excitation processes. (04 Marks)
- 3** a. Choose the correct answers for the following : (04 Marks)
- The free electrons in classical free electron theory are treated as:
A) rigidly fixed lattice points B) liquid molecules C) gas molecules D) none of these
 - The temperature dependence of classical expression for electrical resistivity of a metal is,
A) $\rho \propto T^{1/2}$ B) $\rho \propto T^2$ C) $\rho \propto 1/T^2$ D) $\rho \propto 1/T$
 - The value of Fermi function in Fermi-level is at $T \neq 0 \text{ K}$,
A) zero B) 0.5 C) 0.75 D) 1
 - If E_F is the Fermi energy at absolute zero, then mean energy \bar{E} of electron at absolute zero is,
A) $\bar{E} = 1.5 E_F$ B) $\bar{E} = 2/3 E_F$ C) $\bar{E} = 2/5 E_F$ D) $\bar{E} = 3/5 E_F$
- b. Explain failure of classical free electron theory. (06 Marks)
- c. What are the merits of quantum free electron theory? (06 Marks)
- d. Calculate the Fermi velocity and mean free path for conduction electrons in silver, given that its Fermi energy is 5.5 eV and relaxation time for electrons is 3.83×10^{-14} s. (04 Marks)
- 4** a. Choose the correct answers for the following : (04 Marks)
- The electric dipole moment per unit volume is,
A) magnetization B) dipole moment C) electric polarization D) electric susceptibility
 - Claussius - Mossotti equation does not holds for,
A) crystalline solids B) liquids C) gases D) vacuum

Contd... Q4 (a)

- iii) The relation between B, M and H is,
 A) $H = \mu_0(M + B)$ B) $B = \mu_0(H + M)$ C) $M = \mu_0(H + B)$ D) None of these
- iv) Above curie temperature ferromagnetic substance becomes:
 A) anti-ferromagnetic B) strongly ferromagnetic C) paramagnetic D) diamagnetic
- b. Discuss polarization mechanism in dielectrics and their frequency dependence. (08 Marks)
- c. Differentiate hard and soft magnetic materials with suitable application. (04 Marks)
- d. An electric field of 10^5 V/m is applied on a sample of neon at NTP. Calculate the dipole moment induced in each atom. The dielectric constant of neon is 1.00014. Find the atomic polarizability of neon gas. At NTP 1 kg atom of Ne – gas occupies volume of 22.4 m^3 . (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) In He-Ne laser the laser emission takes place from,
 A) He-atoms only B) Ne-atoms only
 C) both He and Ne atoms D) 50% from Helium and 50% from Neon
- ii) Which of the following leads coherent light:
 A) induced absorption B) Spontaneous emission C) Stimulated emission D) None of these
- iii) The pumping method used in semiconductor diode laser is,
 A) optical pumping B) electric discharge C) forward bias D) chemical reactions
- iv) The life time of metastable state is about,
 A) 10^{-3} sec B) 10^{-13} sec C) 10^2 sec D) 10^{-9} sec
- b. Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein coefficient. (08 Marks)
- c. What is holography? Explain principle of hologram recording using laser. (04 Marks)
- d. A pulsed laser with power 1 mw lasts for ions. If the number of photons emitted per second is 5×10^7 . Calculate the wavelength of laser. (04 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) According to BCS theory, the cooper pair is pair of,
 A) Electron-Proton B) Electron-Electron C) Proton-Proton D) Electron-Neutron
- ii) High temperature superconductors bear the crystal structure of,
 A) cubic B) orthorhombic C) diamond D) perovskite
- iii) The acceptance angle of optical fiber whose RI of core and cladding of 1.55 and 1.50 respectively is,
 A) 32° B) 45° C) 23° D) 15°
- iv) According to Meissner effect, material in super conducting state is,
 A) paramagnetic B) diamagnetic C) ferromagnetic D) anti-ferromagnetic
- b. What is refractive index profile? Describe three types of optical fiber with one application for each type. (08 Marks)
- c. Explain working of SQUID with application. (04 Marks)
- d. An optical fiber of 600 mts long has input power of 120 mw which emerges out with power of 90 mw. Find attenuation in the fiber. (04 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) The lattice parameters $a = b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$ represent,
 A) cubic B) tetragonal C) rhombohedral D) orthorhombic
- ii) The co-ordination number of rock salt is,
 A) 6 B) 8 C) 12 D) 14
- iii) Which of the following has least packing fraction,
 A) sc B) bcc C) fcc D) diamond
- iv) In a simple cubic lattice $d_{111} : d_{110} : d_{100} =$
 A) $\sqrt{6} : \sqrt{3} : \sqrt{2}$ B) $\sqrt{2} : \sqrt{6} : \sqrt{3}$ C) $\sqrt{2} : \sqrt{3} : \sqrt{6}$ D) $\sqrt{3} : \sqrt{6} : \sqrt{2}$
- b. Derive expression for interplanar spacing of crystal in terms of Miller Indices. (07 Marks)
- c. What is atomic packing factor? Calculate packing factor for sc and bcc structure. (05 Marks)
- d. What is Miller Index of plane making intercepts ratio $3a : 4b$ on x- and y- axis and parallel to z-axis. a, b are primitive vectors? (04 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) A bulk material (three dimensions) reduced in one direction is called quantum:
 A) particle B) well C) dot D) wire
- ii) Which belongs to fullerene family?
 A) C_{60} B) C_{70} C) C_{120} D) All
- iii) Velocity of ultrasound through liquid is proportional to,
 A) density B) volume C) bulk modulus D) rigidity modulus
- iv) Ultrasonic waves cannot be transmitted through,
 A) solid B) liquid C) gas D) vacuum
- b. What is NDT? Describe the NDT method of detection of flows in solid using ultrasound. (08 Marks)
- c. What are nano materials? Write the structure and applications of carbon nano tubes. (08 Marks)

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First/Second Semester B.E. Degree Examination, January 2013
Computer Concepts and C Programming

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) Which of the following is not an input device.
 (A) plotter (B) scanner (C) key board (D) mouse
- ii) Conversion of single program to M/C language is done by
 (A) linker (B) compiler (C) editor (D) OS
- iii) Computer is controlled by _____
 (A) Hardware (B) Software (C) .Instructions (D) Statement
- iv) Computer converts data into _____
 (A) Information (B) Charts (C) I/P , O/P (D) Software
- b. Explain the basic structures of a computer, with a neat diagram. (06 Marks)
- c. Explain the following input devices : i) Pen based input devices ii) Optical input devices. (06 Marks)
- d. Explain information processing cycle. (04 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- i) DOS is an example of _____ interface.
 (A) Command line (B) Check box (C) Graphical (D) Parallel
- ii) Email is a system for exchanging messages through a _____
 (A) client (B) program (C) Network (D) back bone
- iii) Every webpage has a unique address, called a _____
 (A) Hyperlink (B) URL (C) HTTP (D) www
- iv) In a _____ n/w all devices are connected to a hub
 (A) bus (B) star (C) ring (D) mesh
- b. Define operating system. What are the functions of operating systems? (06 Marks)
- c. Explain the following storage devices : i) Hard disk ii) Compact disk. (06 Marks)
- d. Explain the characteristics of networks. (04 Marks)
- 3 a. Choose the correct answer : (04 Marks)
- i) 'C' is what kind of language?
 (A) Machine (B) Procedural (C) Assembly (D) Object oriented programming.
- ii) The hexadecimal constant is preceded by :
 (A) OX (B) O (C) HX (D) H
- iii) The number 025 is _____ number.
 (A) Decimal (B) Octal (C) Hexa (D) Binary
- iv) The operator % yields _____
 (A) Quotient (B) Percentage (C) Remainder (D) Fractional part
- b. Briefly explain how to create and run the program. (04 Marks)
- c. Explain 5 – types of data with its range valve. (06 Marks)
- d. Explain formatted input and output functions. (06 Marks)
- 4 a. Choose the correct answer : (04 Marks)
- i) What is the size of character in bytes?
 (A) 1 (B) 2 (C) 3 (D) 4
- ii) Puts is _____ function
 (A) i/p (B) o/p (C) Input output (D) None
- iii) The conversion specifier _____ is used to represent string
 (A) % d (B) % c (C) % f (D) % s
- iv) Keywords are _____
 (A) Identifier (B) Reserved words (C) Variable (D) None
- b. What do you mean by type conversion? Explain explicit type conversion with examples. (04 Marks)
- c. Explain the following operators with examples : i) Conditional ii) Size of iii) Bitwise. (09 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. Determine the value of each of the following logical expressions, where $a = 5$, $b = 10$ and $c = -6$.
- i) $a > b \ \&\& \ a > c$ ii) $b > 15 \ \&\& \ c < 0 \ || \ a > 0$ iii) $(a/2.0 == 0.0 \ \&\& \ b/2.0 == 0.0) \ || \ c < 0.0$.
- (03 Marks)**

PART - B

- 5 a. Choose the correct answer : **(04 Marks)**
- i) The default return type of a function is _____
 (A) int (B) float (C) char (D) double
- ii) How many values returned by functions by default
 (A) ONE (B) TWO (C) THREE (D) FOUR
- iii) Which is not a variable storage class
 (A) Automatic (B) Extern (C) Static (D) Dynamic
- iv) Which keyword is used to declare external variable
 (A) external (B) extern (C) auto extern (D) None
- b. Explain the elements of user defined functions. **(06 Marks)**
- c. Write a function prime that returns 1, if its argument is a prime number and returns 0. Otherwise. Using the same function, write a program to check whether the number is prime or not. **(05 Marks)**
- d. Write a note on parameter passing techniques. **(05 Marks)**
6. a. Choose the correct answer : **(04 Marks)**
- i) Multi way decision making using _____
 (A) if (B) for (C) while (D) switch
- ii) $5 > 3 ? \text{printf}(\text{"hello"}; \text{printf}(\text{"C"});$
 (A) hello (B) C (C) hello C (D) None
- iii) The result of an expression $2 > 8 \ \&\& \ 2 < 8$ is
 (A) True (B) False (C) 10 (D) 20
- iv) Size of (float) is
 (A) 2 (B) 4 (C) 8 (D) 1
- b. Explain switch structure with flowchart and write a program to display name a day in week for the given day number, assume day one is Monday. **(06 Marks)**
- c. Write a program to find the given number is palindrome or not using while loop. **(05 Marks)**
- d. Write a program to find square of a given number using for loop.
 (Note : Find square using successive addition method). **(05 Marks)**
7. a. Choose the correct answer : **(04 Marks)**
- i) Array is an example of _____ data types
 (A) Derived (B) Basic (C) User defined (D) None
- ii) An array a [5] consists of _____ number of elements.
 (A) 10 (B) 5 (C) 25 (D) None
- iii) An array a [5] [3] consists of _____ elements.
 (A) 5 (B) 3 (C) 15 (D) None
- iv) Which of the following is not a data structure
 (A) Linked list (B) Stack (C) Queue (D) Pointer
- b. Explain how a 1 – Dimensional array can be declared and initialized, write a program to add all the 'n' elements of an array. **(06 Marks)**
- c. Explain the following string handling functions, with examples : i) Strcat ii) Strcpy. **(04 Marks)**
- d. Write a C program to multiply A[M X N] and B[P X Q] matrices and stores the result in C matrix. **(06 Marks)**
8. a. Choose the correct answer : **(04 Marks)**
- i) Parallel computing is _____ execution of instructions.
 (A) Simultaneous (B) Serial (C) Accurate (D) Complete
- ii) Which of the following is not a synchronization construct?
 (A) Single (B) Master (C) Section (D) Critical
- iii) How many threads would be created for the parallel execution of `for (x = 0 ; x < 10 ; x++) { }`?
 (A) 10 (B) 9 (C) 11 (D) 0
- iv) Which of the following does not signify the need of using threads?
 (A) Enhanced performance (B) Reduced processor idle time
 (C) Hidden memory latency time (D) Error – free computation.
- b. Explain the data handling in open MP. **(06 Marks)**
- c. What is thread? Explain the need for threads. **(06 Marks)**
- d. Write a note on environment variables of open MP. **(04 Marks)**

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First/Second Semester B.E. Degree Examination, January 2013
Elements of Civil Engineering and Engineering Mechanics

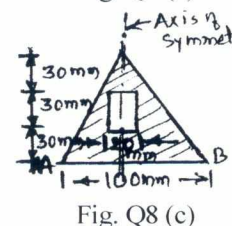
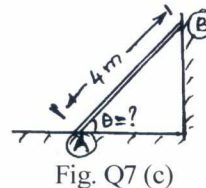
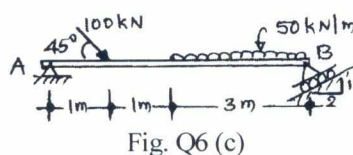
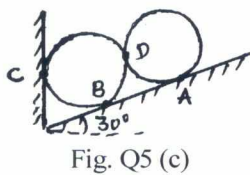
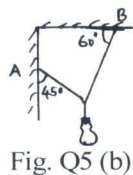
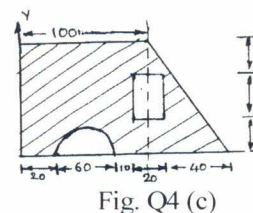
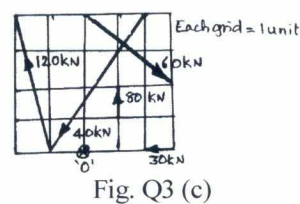
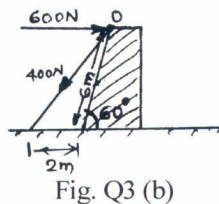
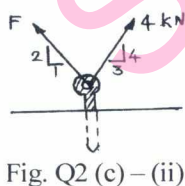
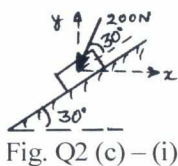
Time: 3 hrs.

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.****PART – A**

- 1** a. Choose the correct answers for the following : (04 Marks)
- i) A branch of civil engineering that deals with testing soils and foundation design is called:
 A) Geotechnical engineering B) Structural engineering
 C) Environmental engineering D) Highway engineering
- ii) Highways which are superior to National Highways and are provided wherever volume of traffic is very high are:
 A) Airways B) Expressways C) Roadways D) District roads
- iii) Composite material made using cement concrete and steel is called:
 A) Plain cement concrete B) Composite cement concrete
 C) Reinforced cement concrete D) Prestressed cement concrete
- iv) A bridge constructed at some angle to river flow is:
 A) Bascule bridge B) Square bridge C) RCC bridge D) Skew bridge
- b. Write a note on impact of infrastructural development on the economy of the country. (08 Marks)
- c. Explain different types of dams, with neat sketches. (08 Marks)
- 2** a. Choose the correct answers for the following : (04 Marks)
- i) Forces whose line of action lie along the same line are:
 A) Coplanar non-concurrent B) Coplanar parallel C) Collinear D) Concurrent
- ii) Moment of a force about a moment centre is the measure of its
 A) Rotational effect B) Translatory effect C) Both A and B D) None of these
- iii) The translatory effect of a couple on the rigid body is,
 A) Zero B) Maximum C) Minimum D) None of these
- iv) An object with only mass but no size in mechanics is,
 A) Rigid body B) Point body C) Particle D) Deformable body
- b. State and prove Varignon's theorem. (08 Marks)
- c. i) A force of 200 N is acting on a block shown in Fig. Q2 (c) – (i). Find the components of forces along horizontal and vertical axes. Ignore the friction between contact surfaces.
 ii) A nail is to be removed by applying 4 kN force and a force 'F' as shown in Fig. Q2 (c)–(ii). Find the magnitude of force 'F' so that the nail is pulled out vertically from the ground. Also, determine the resulting pull along vertical axis. (08 Marks)
- 3** a. Choose the correct answers for the following : (04 Marks)
- i) If two concurrent forces each of P act at right angles to each other, their resultant will be equal to,
 A) $P\sqrt{2}$ B) $2\sqrt{P}$ C) 4P D) P
- ii) The technique of finding the resultant of a system of forces is called,
 A) Composition B) Resolution C) Equilibrium D) None of these
- iii) In a coplanar concurrent force system, if $\sum V = 0$, then the resultant is,
 A) Moment of the force system B) Vertical C) Horizontal D) None of these
- iv) If two forces act at an angle of 120° , the greater force is 50 N and their resultant is perpendicular to smaller force, the magnitude of smaller force is,
 A) 43.33 N B) 32.50 N C) 25 N D) None of these
- b. Determine the resultant force acting on the structure at point 'O' both in magnitude and direction for the system of forces shown in Fig. Q3 (b). (06 Marks)
- c. Determine the magnitude, direction and point of application of the resultant force for the system of forces shown in Fig. Q3 (c) with respect to point 'O'. (10 Marks)
- 4** a. Choose the correct answers for the following : (04 Marks)
- i) Centroid of plane is the point at which,
 A) Weight of the body is concentrated B) Mass of the body is concentrated
 C) Surface area of the body is concentrated D) All of these
- ii) An axis over which one half of the plane figure is just the mirror of the other half is called:
 A) Bottom axis B) Axis of symmetry C) Unsymmetrical axis D) All of these
- iii) The centroid of the plane lamina will not be at its geometrical centre if it is a:
 A) Rectangle B) Square C) Circle D) Right angle triangle
- iv) Centroid of a quarter of circular lamina lies from diameter line at a distance of:
 A) $4R/3\pi$ B) $R/3\pi$ C) $2R/3\pi$ D) None of these
- b. Locate the centroid of a triangle by the method of integration. (06 Marks)
- c. Locate the centroid of the shaded area shown in Fig. Q4 (c) with respect to OX and OY. All dimensions are in mm. (10 Marks)

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) A free body diagram is a diagram,
 - A) Drawn by free hand
 - B) Represents a floating body
 - C) Separating the body from its surrounding and replacing with force vector
 - D) All of these
 - ii) The Lami's theorem can be applied only when number of unknown forces are:
 - A) Two
 - B) Three
 - C) Five
 - D) None of these
 - iii) If a body is in equilibrium, it is concluded that,
 - A) No force is acting
 - B) Resultant is zero
 - C) Moment about any point is zero
 - D) Both B & C
 - iv) For a smooth spherical surface reaction acts:
 - A) Horizontal to plane of contact
 - B) Inclined to plane of contact
 - C) Perpendicular to plane of contact
 - D) None of these
- b. An electric bulb weighing 150 N is suspended between wall and the roof by two wires as shown in Fig. Q5 (b). Determine the tension in the wires using Lami's theorem. (06 Marks)
- c. Find the reaction at the contact surface for two identical cylinders weighing 1000N each as shown in Fig.Q5(c) (10 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) Reaction line at roller support with respect to plane of contact is,
 - A) Oblique
 - B) Perpendicular
 - C) Inclined
 - D) None of these
 - ii) When a load acts at constant rate over given length of a beam is called,
 - A) point load
 - B) udl
 - C) uvl
 - D) All of these
 - iii) At the fixed end of Cantilever, the number of unknowns reaction components are:
 - A) 1
 - B) 2
 - C) 3
 - D) 4
 - iv) Minimum number of members required to form a simple truss is,
 - A) 2
 - B) 3
 - C) 4
 - D) 5
- b. Define perfect and imperfect truss. Hence list the assumptions made in the analysis of simple truss. (06 Marks)
- c. Determine the reaction components for the loaded beam shown in Fig. Q6 (c). (10 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) The maximum frictional force developed when the body just begins to slide is called:
 - A) limiting friction
 - B) Rolling friction
 - C) Static friction
 - D) None of these
 - ii) Compared to static friction, kinetic friction is,
 - A) Larger
 - B) Equal
 - C) Smaller
 - D) None of these
 - iii) Angle of friction is the angle between,
 - A) Normal reaction and friction force
 - B) Normal reaction and resultant
 - C) Weight of the body and friction force
 - D) Normal reaction and weight of the body
 - iv) The force of friction depends on:
 - A) Area of contact
 - B) Roughness of contact surface
 - C) Both A & B
 - D) None of these
- b. Explain briefly: i) Angle of repose ii) Cone of friction (06 Marks)
- c. A ladder weighing 200 N is supported as shown in Fig. Q7 (c). If a man weighing 650 N climbs to the top of the ladder, determine the inclination of the ladder with the floor at which the ladder is to be placed to prevent slipping. Take $\mu = 0.25$ for all contact surfaces. (10 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) Moment of inertia is,
 - A) Second moment of area
 - B) First moment of area
 - C) Third moment of area
 - D) None of these
 - ii) M.I. of circular section about centroidal axis is,
 - A) $\pi D^4 / 32$
 - B) $\pi D^4 / 48$
 - C) $\pi D^4 / 64$
 - D) $\pi D^4 / 128$
 - iii) The unit of radius of gyration is,
 - A) mm
 - B) mm^2
 - C) mm^3
 - D) mm^4
 - iv) M.I. of a square of side 'B' about its centroidal axis is,
 - A) $B^4 / 8$
 - B) $B^4 / 12$
 - C) $B^4 / 36$
 - D) $B^4 / 8$
- b. State and prove parallel axis theorem. (06 Marks)
- c. Determine radius of gyration of shaded area shown in Fig. Q8 (c) about the base AB. (10 Marks)





First/Second Semester B.E. Degree Examination, January 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.
 4. Use of steam tables is not permitted.

PART – A

- 1 a. Choose your answers for the following : (04 Marks)
- Hydro energy is considered as _____,
 A) Tidal energy B) Heat energy C) Indirect solar energy D) Ocean energy
 - The primary processes of solar energy are:
 A) Heliocemical process B) Helioelectrical process C) Heliothermal process D) All of these
 - Lanchashire boiler is a _____ boiler,
 A) Water tube B) Fire tube C) Gas tube D) Air tube
 - The temperature at which water starts to boil in static pressure is _____,
 A) Sensible heat B) Saturation temperature C) Wet steam temperature D) Dry steam temperature
- b. Find the total enthalpy of 0.6 kg of steam with an initial dryness fraction of 0.7 is heated at constant pressure of 7 bar till its temperature rises to 250°C. Assume $C_{ps} = 2.25 \text{ KJ/kgK}$. From steam table, at 7 bar, $h_f = 679.1 \text{ KJ/kg}$, $h_{fg} = 2064.9 \text{ KJ/kg}$, $T_{sat} = 165^\circ\text{C}$. (06 Marks)
- c. Explain with a neat sketch, the working principle of a Lanchashire boiler. (10 Marks)
- 2 a. Choose your answers for the following : (04 Marks)
- It is an example of reaction turbine,
 A) De-Laval turbine B) Kaplan turbine C) Flow turbine D) Pelton wheel
 - Open cycle gas turbine uses _____ as the working substance,
 A) Ammonia B) Nitrogen C) Air D) CO₂
 - _____ is example for reaction water turbine,
 A) Pelton wheel B) Francis turbine C) Kaplan turbine D) Both B and C
 - Method of improving efficiency by successive stages in a turbine is _____,
 A) Governing B) Compounding C) Supercharging D) Turbocharging
- b. With a neat sketch explain the working of a open cycle gas turbine. (08 Marks)
- c. Sketch and explain the working of reaction steam turbine with the help of pressure and velocity profile diagram. (08 Marks)
- 3 a. Choose your answers for the following : (04 Marks)
- The motion of a piston is _____,
 A) Rotary B) Oscillatory C) Rectilinear D) Circular
 - Diesel engine is also called as _____,
 A) 4-stroke engine B) 2-stroke engine C) C.I. engine D) S.I. engine
 - The power measured in the crankshaft of engine is _____,
 A) Indicated power B) Brake power C) Horse Power D) Torque
 - _____ is fed into the diesel engine through inlet valve,
 A) Fuel B) Diesel C) Air fuel mixture D) Air
- b. With the help of a line diagram, explain the working of a two-stroke petrol engine. (08 Marks)
- c. A 4-cylinder two-stroke petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder, stroke to bore ratio 1.5. Also calculate the specific fuel consumption if brake thermal efficiency is 28%. The calorific value of fuel is 43900 KJ/kg. (08 Marks)
- 4 a. Choose your answers for the following : (04 Marks)
- _____ is the heart of the refrigerator,
 A) Compressor B) Condenser C) Expansion valve D) Evaporator
 - The ratio of heat absorbed in a system to work supplied is _____,
 A) Refrigeration effect B) COP C) Ton of refrigeration D) Coding effect
 - In a refrigerator exchange of heat takes place in _____,
 A) Condenser B) Evaporator C) Compressor D) Both A and B.
 - _____ is the refrigerant used in vapour compression refrigerator,
 A) Ammonia B) Air C) Freon-22 D) Nitrogen

- 4 b. Explain with a neat sketch the working of vapour compression refrigerator. (08 Marks)
 c. With a neat sketch explain the working of a typical room air conditioner. (08 Marks)

PART – B

- 5 a. Choose your answers for the following : (04 Marks)
- _____ object are produced in a engine lathe.
 A) Plane objects B) Curved objects C) Circular objects D) None of these
 - Taper turning is an operation of producing _____ on the work piece.
 A) Tapping B) Reaming C) Taper D) Boring
 - Flute in a twist drill is used for,
 A) Flow of Coolant B) Removal of material C) Easy removal of curl chips D) All of these
 - _____ is not a drilling operation,
 A) Taper turning B) Reaming C) Knurling D) Turning
- b. Explain with a schematic diagram, show how a centre lathe is specified. (08 Marks)
 c. How are counter sinking and counter boring operation done on a drilling machine? Explain with suitable sketches. (08 Marks)
- 6 a. Choose your answers for the following : (04 Marks)
- Milling cutter is a _____,
 A) Multipoint cutting tool B) Abrasive cutter C) Single point cutting tool D) Metal removing machine
 - Milling is a _____,
 A) Metal removal process B) Metal cutting processor C) Metal joint process D) None of these
 - _____ is a natural abrasive mineral consists of aluminium oxide.
 A) Diamond B) Corundum C) Emery D) Aluminium Nitrate
 - Grinding is also called as _____
 A) Turning B) Metal cutting C) Abrasive machining D) Lapping
- b. Sketch and explain the principle and working of a horizontal milling machine. (08 Marks)
 c. With a neat sketch, explain the surface grinding machine. (08 Marks)
- 7 a. Choose your answers for the following : (04 Marks)
- Welding is a _____ process used for metals,
 A) Metallurgical joining B) Forged forming C) Mechanical joining D) Adhesive bonding
 - Gas welding is a _____ method of joining two metals.
 A) Fission B) Fusion C) Gas reaction D) Oxidizing
 - Lubricants are used to reduce the _____ in machines.
 A) Efficiency B) Effectiveness C) Friction D) Torque
 - In thrust bearing the bearing pressure will be _____,
 A) Radial B) Circular C) Axial D) Centrifugal
- b. With a neat sketch, explain the working of oxy-acetylene gas welding. (08 Marks)
 c. List the important properties of good lubricant. (08 Marks)
- 8 a. Choose your answers for the following : (04 Marks)
- The _____ motion is the simplest form of transmitting power with minimum losses.
 A) Rotational B) Rectilinear C) Oscillatory D) None of these
 - _____ is also called as positive drive mechanisms.
 A) Belt drive B) Chain drive C) Gear drive D) Both B and C.
 - _____ type of gear drive is used for transmitting power between two perpendicular shafts.
 A) Bevel gear B) Elliptical gear C) Helical gears D) Spur gear
 - For high power transmission _____ is most suitable power transmission.
 A) Belt drive B) V-belt drive C) Rope drive D) Gear drives
- b. Derive an expression for the length of the belt in an open drive system. (08 Marks)
 c. Two spur gears A and B connect two parallel shafts that are 500 mm apart. Gear A runs at 400 rpm and gear B at 200 rpm. If the circular pitch is 30 mm. Calculate the number of teeth on gears A and B. (08 Marks)

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First/Second Semester B.E. Degree Examination, January 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 Ohm's law can not be applied to
 A) Resistance B) Inductance C) Capacitance D) Diode
- ii) The practical unit of electrical energy is
 A) kWh B) Wh C) Watt - second D) Joule second
- iii) The self inductance 'L' is given by
 A) $N\phi I$ B) NI/ϕ C) $N\phi/I$ D) $I/N\phi$
- iv) A current of 20 A is reversed in 0.1 sec through an inductance of 1 H, thus emf induced is ___ volts.
 A) 200 B) - 200 C) - 600 D) +400
- b. State and explain Kirchoff's laws. (06 Marks)
- c. Obtain an equation for the energy stored in a magnetic field. (04 Marks)
- d. A circuit consists of two parallel resistors having resistance of 20 Ω and 30 Ω respectively., connected in series with 15 Ω . If current through 15 Ω resistor is 3A, find (i) current in 20 Ω & 30 Ω resistors, (ii) voltage across the whole circuit, (iii) the total power and power consumed in all resistances. (06 Marks)
- 2** a. Choose the correct answers for the following : (04 Marks)
- i) The power factor of a pure resistive circuit is
 A) zero B) unity C) lagging D) leading
- ii) The average power consumption is a pure inductor is
 A) maximum B) minimum C) zero D) infinite
- iii) The admittance is _____ impedance.
 A) equal to B) square of C) reciprocal of D) square root of
- iv) A series R.C. circuit of $6 - j8\Omega$ carries a current of 10A then its power consumption is
 A) 60 W B) 600 W C) 100 W D) 80 W
- b. Define and derive an expression for root mean square value of an alternating quantity. (06 Marks)
- c. Show that current leads voltage in R-C series circuit. (04 Marks)
- d. An impedance in parallel with a 100 μF capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4A and power loss in the coil is 600 W. Calculate (i) resistance of the coil (ii) inductance of the coil (iii) the power factor of the circuit. (06 Marks)
- 3** a. Choose the correct answers for the following : (04 Marks)
- i) In a 3 ph. System emfs are
 A) 30° apart B) 60° apart C) 90° apart D) 120° apart
- ii) In a 'O' connected system relation between I_L and I_{ph} is
 A) $I_L = I_{ph}$ B) $I_L = I_{ph} / \sqrt{3}$ C) $I_L = \sqrt{3} \cdot I_{ph}$ D) $I_L = 3 I_{ph}$
- iii) The total active power in a 3 ph. System is
 A) $\sqrt{3} V_L I_L$ B) $\sqrt{3} V_L I_L \cos\phi$ C) $V_L I_L$ D) $\sqrt{3} V_L I_L \sin\phi$
- iv) If the two wattmeters show equal reading, power factor is
 A) zero B) 0.5 C) unity D) 0.866
- b. With the help of connection diagram and phasor diagram show that two wattmeters are sufficient to measure the active power in a three phase three wire system with balanced star connected load. (10 Marks)
- c. A 3 phase 230 V supply is given to balanced load which is Δ connected. Impedance in each phase of the load is $8 + j6 \Omega$. Determine the phase current and the total power consumed. (06 Marks)
- 4** a. Choose the correct answers for the following : (04 Marks)
- i) In a dynamometer wattmeter the fixed coil is
 A) current coil B) Potential coil C) current or pressure coil D) None of these
- ii) In the energy meter, constant speed of rotation of disc is provided by
 A) shunt magnet B) series magnet C) brake magnet D) creeping holes
- iii) Ratio minimum fusing current / current rating is fuse is
 A) fusing factor B) rated current C) fusing current D) melting current
- iv) A good earthing should provide _____ resistance in earthing point.
 A) low B) high C) medium D) very high

- b. With a neat diagram, explain the construction and principle of operation of a single phase induction energy meter. (08 Marks)
- c. With a neat diagram, explain the two-way control of a lamp. (04 Marks)
- d. What are the precautions to be taken against electric shock? (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The emf generated by a d.c. generator depends on _____
 A) Flux only B) speed only C) Flux & Speed D) Terminal voltage
- ii) For 'P' pole lap wound armature DC machine, no. of parallel ports _____
 A) 2 B) 2P C) P D) P/2
- iii) Yoke is made up of _____
 A) Copper B) Aluminium C) Cast steel D) Cast Iron
- iv) In a 240 V d.c. motor, $E_b = 220$ V, $R_a = 0.5 \Omega$, I_a is _____
 A) 20 A B) 10 A C) 80 A D) 40 A
- b. With a neat sketch, explain the construction of a d.c machine. (06 Marks)
- c. Derive the torque equation of d.c. motor. (05 Marks)
- d. A 4 pole generator with wave wound armature has 51 slots each having 24 conductors. The flux per pole is 0.01 Weber. At what speed the armature rotate to give an induced emf of 220 V? What will be the voltage of the winding in lap and the armature rotates at the same speed. (05 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) The copper loss of certain transformer at half full load is 200 W. Then the full load copper loss is
 A) 100 W B) 200 W C) 400 W D) 800 W
- ii) If secondary current of 100/10 V transformer is 10 A, then primary current is
 A) 1 A B) 2 A C) 10 A D) 100 A
- iii) The core of a transformer is laminated to reduce
 A) eddy current B) hysteresis current C) copper loss D) friction loss
- iv) The frequency loss of secondary voltage is _____ that of primary voltage.
 A) greater than B) less than C) same as D) double
- b. Explain the principle of operation of a single phase transformer. Mention the types of transformers. (08 Marks)
- c. A 600 kVA, 1 ph transformer has an efficiency of 92% both at full load and half load upf. Determine the efficiency at 75% full load 0.9 power factor. (08 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) A 4 pole, 1200 rpm alternator generates emf at a frequency of
 A) 25 Hz B) 40 Hz C) 50 Hz D) 60 Hz
- ii) The field winding of an alternator is excited by
 A) dc B) ac C) ac & dc D) 3 ph. ac
- iii) A salient pole field construction is used for alternator having
 A) low & medium speed B) large speed C) very large speed D) none of these
- iv) The values of pitch factor (k_p) for full pitch
 A) less than 1 B) more than 1 C) 1 D) 0
- b. Derive the emf equation for a star connected 3 phase synchronous generator. (06 Marks)
- c. Sketch the two types of rotors used in an alternator. (04 Marks)
- d. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 web. and is distributed sinusoidally. The winding factor is 0.97 and pitch factor is 0.98. Calculate the line emf. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) The slip of an induction motor at standstill is
 A) 0 B) 1 C) ∞ D) - 1
- ii) Synchronous speed of three ph. Induction motor is given by
 A) $N_s = 120 fP$ B) $120f/P$ C) $120 P/f$ D) $fP / 120$
- iii) A 4 pole, 440 V, 50 Hz induction motor is running at a slip of 4% the speed of motor is
 A) 1260 rpm B) 1440 rpm C) 1500 rpm D) 1560 rpm
- iv) Speed of an induction motor is _____ that of N_s
 A) greater than B) less than C) same as D) double
- b. Prove that a rotating magnetic field of constant magnitude is produced when the stator winding of a polyphase induction motor are energized by a balanced 3 phase supply. Explain the principle of operation of induction motor. (10 Marks)
- c. A 4 pole, 3 phase, 50 Hz induction motor runs at a speed of 1470 rpm. Find the frequency of the induced emf in the rotor under this condition. (06 Marks)

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First/Second Semester B.E. Degree Examination, January 2013
Basic Electronics

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) A device which allows the current flow in one direction but does not allow it in the opposite direction is called ____.
- (A) Transistor (B) Filter (C) Regulator (D) Rectifier.
- ii) The capacitance of a forward biased p – n junction is called ____.
- (A) Diffusion (B) Conventional (C) Drift (D) Transition
- iii) The zener power dissipation is given by the product of ____.
- (A) V_R, I_Z (B) V_F, I_Z (C) V_Z, I_Z (D) None of these
- iv) The maximum efficiency of full wave rectifier is ____.
- (A) 40.6% (B) 60.4% (C) 78.5% (D) 81.2%.
- b. Explain the forward and reverse characteristics for a Ge – diode, with a neat figure. (05 Marks)
- c. With a circuit diagram, explain the working of a full wave rectifier. Draw relevant waveforms. (06 Marks)
- d. A 9V reference source is to be designed using a zener diode and a resistor connected in series to a 30V supply. Select suitable components and calculate the circuit current when the supply voltage drops to 27V. Assume $I_{ZT} = 200\text{mA}$. (05 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- i) A transistor is cutoff when ____.
- (A) Both emitter and collector function reverse biased
 (B) The emitter function is reversed biased but the collector function is forward biased.
 (C) Both emitter and collector function are forward biased.
 (D) The emitter function is forward biased but the collector function is reversed biased.
- ii) If $\alpha = 0.95$, then the value of β of the transistor is ____.
- (A) 0.05 (B) 19 (C) 100 (D) 120
- iii) The output characteristics of a CE configuration is a graph between ____.
- (A) V_{BE}, I_B (B) V_{BE}, V_{CE} (C) V_{CE}, I_C (D) V_{BE}, I_E
- iv) The Q – point is also known as ____.
- (A) Open point (B) Operating point (C) D.C. point (D) A.C. point.
- b. Explain the working of a current amplification using transistor. (05 Marks)
- c. Explain with the help of circuit diagram the working of input and output characteristics of transistor in CB configuration. (07 Marks)
- d. For a certain transistor circuit, $I_C = 12.42\text{mA}$ and $I_B = 200\mu\text{A}$, find i) I_E ii) α and β of transistor. (04 Marks)
- 3 a. Choose the correct answer : (04 Marks)
- i) In the biasing circuit, the one which gives most stable operating point.
- (A) Base bias (B) Collector to base bias (C) Voltage divider bias (D) None of these.
- ii) Stability factor S for base bias circuit is ____.
- (A) $S = 1 + \beta$ (B) $S = 1 - \beta$ (C) $S = 1/(1 - \beta)$ (D) $S = 1/(1 + \beta)$
- iii) Diode can be used for compensation of ____ changes in voltage divider bias circuit
- (A) V_{BE} (B) V_{CE} (C) V_{CC} (D) V_E
- iv) In emitter bias circuit ____ is connected between emitter and ground.
- (A) Inductor (B) Capacitor (C) Resistor (D) Diode
- b. With a circuit diagram, explain the operation of collector – to base bias circuit. (08 Marks)
- c. The voltage divider bias circuit has $V_{CC} = 15\text{V}$, $R_1 = 6.8\text{k}\Omega$, $R_2 = 3.3\text{k}\Omega$, $R_C = 900\Omega$, $R_E = 900\Omega$ and $h_{FE} = 50$, $V_{BE} = 0.7\text{V}$. Find the levels of V_E, I_B, I_C, V_{CE} and V_C . Draw the DC load line and mark the Q point on that. (08 Marks)
- 4 a. Choose the correct answer : (04 Marks)
- i) SCR is a ____ device
- (A) NPN (B) PNP (C) PNPN (D) PNN
- ii) SCR crow bar circuit is used for protection against
- (A) under voltage (B) over current (C) under current (D) over voltage.
- iii) The intrinsic stand – off ratio of UJT ____
- (A) must be less than unity (B) must be greater than unity (C) must be zero (D) must be negative
- iv) FET is a ____ controlled device.
- (A) Voltage (B) Current (C) Power (D) None of these
- b. Explain the working of two transistor model of SCR. (06 Marks)
- c. Explain with a neat figure the construction of a P – channel JFET. (06 Marks)
- d. Give the equivalent circuit of UJT. (04 Marks)

PART – B

- 5 a. Choose the correct answer : (04 Marks)
- In an oscillator we use ____ feedback.

(A) Positive	(B) Negative	(C) Neither	(D) Unity gain
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 - The two Barkhausen conditions to be satisfied by oscillator are ____

(A) $ A\beta \leq 1$, shift = 0°	(B) $ A\beta \geq 1$, shift = 0°	(C) $ A\beta \geq 1$, shift = 90°	(D) $ A\beta \geq 1$, shift = 180°
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 - In RC coupled amplifier the d.c. component is blocked by ____

(A) load resistance R_L	(B) coupling capacitor, C_C	(C) R_B	(D) the transistor
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 - $f_1(f_L)$ and $f_2(f_H)$ are known as ____ frequencies

(A) half	(B) half power	(C) decibel	(D) mid band
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- b. With the help of circuit diagram, explain the working of a RC coupled single state CE amplifier. (06 Marks)
- c. List the advantages of negative feedback. (05 Marks)
- d. Calculate the value of an inductor to be used in Colpitt's oscillator to generate a frequency of 10MHz. Assume the values of $C_1 = 100$ pf and $C_2 = 50$ pf. (05 Marks)
- 6 a. Choose the correct answer : (04 Marks)
- The ideal value of CMRR is ____

(A) 90dB	(B) 2×10^5	(C) 0	(D) ∞
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 - The PSRR is generally measured in ____

(A) dB	(B) mV/V	(C) $\mu V/V$	(D) V/ μS
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 - The gain of voltage follower is ____

(A) zero	(B) infinite	(C) negative	(D) unity
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 - If we apply a square waveform to a differentiator, then we get ____ at the output

(A) cosine wave	(B) ramp	(C) sine wave	(D) train of impulses
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- b. Give the ideal op-amp characteristics. (05 Marks)
- c. With the help of circuit diagram, explain the working of an op-amp used as integrator. (06 Marks)
- d. Design an adder circuit using op – amp to obtain an output expression $V_0 = -(0.1V_1 + 0.5V_2 + 20V_3)$, where V_1, V_2 and V_3 are the inputs. Select $R_f = 10k\Omega$ (05 Marks)
- 7 a. Choose the correct answer : (04 Marks)
- Over modulation exists when modulation index is ____

(A) 1	(B) 0	(C) > 1	(D) < 1 .
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 - The relation between carrier power and total power in an AM wave is ____

(A) $P_C = P_T (1+(m^2/4))$	(B) $P_C = P_T (1+(m^2/2))$	(C) $P_T = P_C (1+(m^2/4))$	(D) $P_T = P_C (1+(m^2/2))$
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 - The amplitude of both the side bands in an AM wave is ____

(A) $E_C^2/2m$	(B) $m^2E_C/2$	(C) $mE_C/2$	(D) $m^2E_C^2/4$
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 - Hexadecimal and octal numbering systems are similar for the first ____

(A) 9 digits	(B) 8 digits	(C) 7 digits	(D) 6 digits.
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- b. Explain the need for modulation. (06 Marks)
- c. With the help of block diagram, explain the working of super heterodyne receiver. (06 Marks)
- d. Perform the following decimal subtraction using 9's complement method : i) $49 - 24$ ii) $321 - 579$. (04 Marks)
- 8 a. Choose the correct answer : (04 Marks)
- For EX – NOR gate the output is 1 if ____

(A) even number of inputs is 0	(B) even number of inputs is 1
(C) odd number of inputs is 0	(D) odd number of inputs is 1.
 - Which of these are universal gates?

(A) only NOR	(B) only NANS	(C) Both NOR & NAND	(D) NOT, AND, OR
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 - The result of binary addition $1 + 1 + 1$ is ____

(A) carry 0, sum 0	(B) carry 0, sum 1	(C) carry 1, sum 0	(D) carry 1, sum 1
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 - A half adder has ____ inputs and ____ outputs.

(A) 1, 1	(B) 1, 2	(C) 2, 1	(D) 2, 2
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- b. State Define Morgan's theorems. (04 Marks)
- c. Simplify the following Boolean expressions : i) $Y = AB + \bar{A}C + BC$ ii) $Y = (A + \bar{B} + \bar{C})(A + \bar{B} + C)$ (06 Marks)
- iii) $Y = C(B + C)(A + B + C)$. (06 Marks)
- d. What is full adder? Give its truth – table. Implement the full adder using logic gates. (06 Marks)

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Question Paper Version : C

First/Second Semester B.E Degree Examination, January 2013
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.

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1. The main objective of the directive principles of state policy is to establish
a) Welfare state in India b) Federal state c) Capitalist state d) Hindu state.
 2. A person who has been arrested to be produced before the court/magistrate within
a) 24 hours excluding journey hours b) 48 hours
c) 24 hours including journey hours d) one month.
 3. Which provisions of the constitution provides constitutional remedy to protect the fundamental rights of the citizens in India?
a) Articles 15 & 16 b) Articles 29 & 30 c) Articles 20 & 21 d) Articles 226 & 32.
 4. One of the impediments to discharge the responsibility by engineers is
a) Ego – centric tendencies b) Cooking c) With holding information d) Ambiguity.
 5. Professional Ethics means
a) Set if rules relating to personal character. b) Set of moral standards of profession.
c) Depth knowledge in the field of profession. d) Set of regulations framed by engineering colleges.
 6. A new technology in the field of any profession is intimately connected with
a) Good work b) Honesty c) Risk d) Penalty.
 7. Who appoints the Chief Justice and other Judges of the High court?
a) Prime Minister b) Law Minister c) President d) Governor

8. How many members are nominated by the President of India to the Rajya Sabha?
 a) 2 b) 12 c) 20 d) 10
9. In which of the House motion of no confidence against the government can only be introduced and passed?
 a) Lok Sabha b) Rajya Sabha c) Cabinet d) None of these
10. The use of intellectual property of others without proper permission is known as
 a) Trimming b) Dishonesty c) Plagiarism d) Forging
11. Who has the Power to Pardon the death punishment of a criminal?
 a) President b) Prime Minister c) Attorney General of India d) Chief Justice of India
12. Who has the power to certify the money bill?
 a) Speaker of Lok Sabha b) Chairman of Rajya Sabha
 c) President of India d) Auditor and Comptroller – General of India.
13. How many members are nominated by the President of India to Lok Sabha under a special Provisions of the constitution from Anglo – Indian Community?
 a) 40 b) 20 c) 12 d) 2
14. Which bill can be introduced only in Lok Sabha with prior recommendations of the President of India?
 a) Ordinary bill b) Bill relating to impeachment of CJI
 c) Money bill d) Constitution Amendment bill
15. The President of India is elected by “Electoral College” consisting of
 a) Elected members of Lok Sabha, Rajya Sabha and members of legislative assemblies.
 b) Only the members of Parliament (LS & RS).
 c) All the adult people of India.
 d) All the elected members of central legislature and state legislature including MLCS.
16. The country almost loses its federal structure and becomes unitary in form during
 a) State emergency b) Financial emergency c) National emergency d) All of these
17. The voting right of the citizens in India starts from the age of
 a) 21 years b) 25 years c) 30 years d) 18 years
18. To pass the bill for constitutional amendment under article 368, the procedure is rigid, because it requires the approval by
 a) 1/3rd majority of the member of parliament b) 2/3rd majority
 c) All the members present and voting d) Half of the strength of parliament
19. What is the minimum age to become the members of Rajya Sabha and Lok Sabha?
 a) 30 years & 25 years b) 21 years & 18 years c) 35 years & 30 years d) 25 years & 35 years
20. Who was the first woman nominated member of the Rajya Sabha?
 a) Indira Gandhi b) Smt. Prathibha Patil c) Smt. Sarojini Naidu d) Smt. Rukmini Devi Arundale
21. What is the age of retirement of the judges of the Supreme Court?
 a) 62 years b) 65 years c) 60 years d) 58 years
22. The state emergency can be promulgated by the president of India on the ground of
 a) Constitutional crisis in the state (Breakdown of constitutional machinery in the state)
 b) Waging of war by foreign country
 c) Natural calamity in the state d) Internal disturbance

23. The concept of 'Judicial Review' is borrowed from
 a) U.K b) U.S.A c) U.S.S.R d) Switzerland
24. Which of the following is not the function of the election commission?
 a) Allotting symbols to political parties b) Framing of code of conduct for election
 c) Selection of candidates for election d) Preparation of electoral rolls
25. Who is empowered to amend any Provisions of the Constitution Under Art. 368?
 a) Parliament b) President
 c) Law Minister d) Cabinet headed by Prime Minister
26. Literal meaning of 'Quo Warranto' is
 a) to command b) on what authority?
 c) you may have the body d) to quash the decision of lower court
27. Who is the Constitutional head of the state government?
 a) President b) Governor c) Chief Minister d) Prime Minister
28. Freedom of Speech and Expression guaranteed by the constitution under Article 19 is subject to reasonable restrictions on the ground of
 a) protection of SCs and STs b) sovereignty and integrity of India
 c) securing the dignity of the office of Prime Minister d) none of these
29. Which one is not included under Directive Principles of State Policy?
 a) To protect and improve the environment, and to safeguard forests and wildlife
 b) To bring about prohibition of consumption of intoxicating liquor
 c) To take stringent measures to eliminate corruption
 d) To provide Free and Compulsory education to the children upto the age of 14 years.
30. Which provision under Part – IV provides for the encouragement of settlement of international disputes by arbitration?
 a) Art. 44 b) Art. 39 c) Art. 51 d) Art. 50
31. The writ of 'mandamus' will not be issued against
 a) President of India b) Prime Minister of India
 c) Administrative authorities d) Tribunal
32. What is the term of the members of Rajya Sabha?
 a) 5 years b) 6 years c) 4 years d) 3 years
33. Who is presiding over the Joint-Session of the Parliament?
 a) Prime Minister b) President c) Speaker of Loka Sabha d) Law Minister
34. One of the Tests to be adopted for the classification People into categories under Article 14 is
 a) intelligible differentia b) intelligent quotient c) age d) caste
35. 'Creamy Layer' relating to reservation of public employment means.
 a) Highly – educated persons b) Highly cultured persons
 c) Persons having higher annual incomes d) Public servants having top posts
36. The protection to criminals under Art. 20, "No person shall be prosecuted and punished for the same offence more than once" is
 a) Ex-Post facto law b) Self-Incrimination c) Double Jeopardy d) Capital punishment

37. Who is empowered to promulgate an ordinance at the centre when there is no session?
a) Speaker of Lok Sabha b) Prime Minister c) President of India d) Vice President of India
38. Under which schedule the distribution of legislative powers are enumerated in India constitution?
a) Schedule 10th b) Schedule 9th c) Schedule 5th d) Schedule 7th
39. Which article under the constitution gives power to Election Commission to conduct elections?
a) 234 b) 320 c) 324 d) 368
40. By what Amendment, child education between the ages of 06 and 14 years is made compulsory?
a) 42nd Amendment, 1976 b) 86th Amendment, 2002
c) 68th Amendment, 2000 d) 44th Amendment, 1978
41. The main objectives and values of the constitution have been enshrined in
a) Fundamental rights b) fundamental duties
c) directive principles of state policy d) preamble of the constitution.
42. India is called a 'Republic' because
a) The people of India are sovereign.
b) In India, the head of the nation is elected by the people for a fixed term.
c) The Prime Minister who is the head of the cabinet is elected by the people.
d) India is the union of states.
43. What is the source of political/democratic power in India?
a) People b) Constitution c) Parliament d) King dynasty.
44. Which of the following Act made the Indian legislature bicameral for the first time?
a) Indian councils Act, 1909 b) Government of India Act, 1919
c) Government of India Act, 1935 d) Indian independence Act, 1947.
45. Who among the followings was appointed as the Chairman of the drafting committee of the constitution?
a) Dr. Rajendra Prasad b) M.N. Roy c) Dr. B.R. Ambedkar d) Jawaharlal Nehru.
46. In which case did Supreme Court hold that the preamble was a part of the constitution?
a) Berubari case b) Golaknath case
c) Keshvananda Bharathi case d) Menaka Gandhi case.
47. Under which article and part of the constitution the fundamental duties are enshrined?
a) Article 39A and Part-IV b) Article 51A and Part-IV A
c) Article 21A and Part-III d) None of these.
48. The Parliament has enacted a law to prohibit 'child labour' on the authority of
a) Article 15 b) Article 16 c) Article 23 d) Article 24
49. 'Right to life and personal liberty' includes right to
a) Move freely anywhere within the territory of India.
b) Practice any profession or to carry on any trade or business.
c) Privacy. d) Mercy killing.
50. Who is the present nominal head of the nation?
a) Shri. Pranab Mukharjee b) Smt. Prathiba Patil c) Dr. Manmohan Singh d) Smt. Sonia Gandhi

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Question Paper Version : A

First/Second Semester B.E Degree Examination, June 2012

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. Which of the following is a biotic component of an ecosystem?
a) Fungi b) Solar light c) Temperature d) Humidity
2. In an ecosystem, the flow of energy is
a) Bidirectional b) Cyclic c) Unidirectional d) Multidirectional
3. The first International Earth Summit was held at
a) Johannesburg b) Rio-de Janerio c) Kyoto d) Stockholm
4. ISO 14000 standards deal with
a) pollution management b) environmental management
c) risk management d) None of these.
5. The major atmospheric gas layer in stratosphere is
a) Hydrogen b) Carbon dioxide c) Ozone d) Helium.
6. Which of the following is not the environmental effect of industrialization, in general?
a) Solid waste b) Water pollution c) Economic growth d) Air pollution.
7. EIA can be expanded as
a) Environment and Industrial Act b) Environment and Impact Activities
c) Environmentally Important Activity d) Environmental Impact Assessment.
8. The impact of construction of dams is
a) submerged forests b) loss of wild life habitat
c) damages down stream ecosystem d) All of these.

9. Among the fresh water available on the Earth, the percentage of surface water is about
 a) 50 % b) 10 % c) 5 % d) less than 1%.
10. Major sources of fluoride is
 a) Ground water b) Toothpaste c) River water d) Food products
11. Bluebaby syndrome (methaemoglobinemia) is caused by the contamination of water due to
 a) Phosphates b) Sulphur c) Nitrates d) Arsenic
12. The most important fuel used by nuclear power plant is
 a) U-235 b) U-248 c) U-238 d) U-245
13. Bacteriological pollution of water is due to the presence of
 a) silt and grit b) parasitic worms
 c) suspended particals d) floating materials.
14. Lead poisoning may cause
 a) reduction in haemoglobin b) kidney damage
 c) mental retardation d) all of these.
15. Air pollution from automobiles can be controlled by fitting
 a) electrostatic precipitator b) wet scrubber
 c) catalytic converter d) all of these.
16. Which of the following are non-biodegradable?
 a) Plastics b) Domestic sewage c) Detergents d) Both a and c
17. Which of the following is a secondary air pollutant?
 a) Carbon monoxide b) Sulphur dioxide c) Ozone d) Carbon dioxide.
18. In which year, the Hon'ble Supreme Court of India made environmental education compulsory subject at all the levels of education?
 a) 2000 b) 2001 c) 2002 d) 2003
19. Environmental protection is a fundamental duty of the citizen of India under the article
 a) 51-A(8) b) 48-A c) 47 d) 21
20. Ozone layer is present in
 a) Stratosphere b) Mesosphere c) Thermosphere d) Troposphere
21. Chernobyl nuclear disaster occurred in the year
 a) 1984 b) 1952 c) 1986 d) 1987
22. Which of the following is not a renewable source of energy?
 a) Wind energy b) Tidal wave energy c) Solar energy d) Fossil fuels.
23. Electromagnetic radiation can cause
 a) Plague b) Malaria c) Cancer d) Dengue fever.
24. Nuclear power plant in Karnataka is located at
 a) Bhardravathi b) Sandur c) Raichur d) Kaiga
25. Which place in India, the tidal energy has been experimented?
 a) Goa b) Karnataka c) Kerala d) Tamil Nadu

26. In hydro power plants, power is generated by
a) Hot springs b) Wind c) Water d) Solar energy
27. Environmental pollution is due to
a) rapid urbanization b) deforestation c) afforestation d) both a and b
28. Definition of noise is
a) Loud sound b) Unwanted sound c) constant sound d) Sound of high frequency
29. Sound, beyond which of the following level, can be regarded as a pollutant?
a) 40 dB b) 80 dB c) 120 dB d) 150 dB
30. 'Minamata disease' is caused by
a) Lead b) Arsenic c) Mercury d) Cadmium.
31. An alternative eco-friendly fuel for automobiles is
a) Petrol b) Diesel c) CNG d) Kerosene
32. Population explosion will cause
a) Bio-diversity b) Stress on ecosystem
c) More employment d) None of these.
33. Which of the following is not a solution for global warming?
a) Reducing fossil fuel consumption b) Planting more trees
c) Deforestation d) None of these.
34. The first of the major environmental protection act to be promulgated in India was
a) Air act b) Water act c) Environmental act d) Noise pollution act
35. Population explosion will cause
a) Socio-economic problems b) Energy crises
c) Food scarcity d) All of these.
36. Global warming could affect
a) Climate b) Increase in sea level
c) Melting of glaciers d) All of these.
37. Acid rain can be controlled by
a) Reducing SO₂ and NO₂ emission b) Reducing oxygen emissions
c) Increasing number of lakes d) Increasing the forest cover
38. The pH value of the acid rain water is
a) 5.7 b) 7.0 c) 8.5 d) 7.5
39. Major compound responsible for the destruction of stratospheric ozone layer is
a) Oxygen b) CFC c) Carbon dioxide d) Methane
40. Domesticated animals are used for
a) Dairy products b) Production of fiber c) Production of meat d) All of these.
41. World ozone day is being celebrated on
a) September 5th b) October 5th c) September 16th d) September 11th
42. Bhopal gas tragedy was due to the leakage of
a) Methyl isocyanate (MIC) b) Sulphur dioxide
c) Mustard gas d) Methane

43. The forest (conservation) Act was enacted in the year
a) 1986 b) 1974 c) 1980 d) 1972
44. The leader of Chipko movement is
a) Medha Patkar b) Sunderlal Bahuguna c) Vandana Shiva d) Suresh Heblkar
45. An international conference on environmental education was held in December 1982 at
a) Kyoto b) Vienna c) New Delhi d) London
46. The world environmental day is celebrated on
a) June 5th b) November 5th c) April 5th d) December 5th
47. India has the world's largest share of
a) Manganese b) Copper c) Mica d) Diamond
48. The hydrological cycle is related to
a) Water cycle and balance b) Water and electricity
c) Hydropower d) Water characterization
49. An important NGO involved in global environmental protection is
a) UNICEF b) Green peace c) WHO d) CPCB
50. About 3/4th of the country's coal deposits are found in
a) Karnataka b) Tamil Nadu c) Kashmir d) Bihar & Orissa

Second Semester B.E. Degree Examination, January 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 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 correct answers for the following : (04 Marks)
- i) The general solution of the equation $p^2 - 5p + 6 = 0$ is : A) $(y - 2x - c)(y - 3x - c) = 0$
B) $(y + 2x - c)(y + 3x - c) = 0$ C) $(y - 2x - c)(y + 3x - c) = 0$ D) $(y - x - c)(y + x - c) = 0$
- ii) If a differential equation is solvable for y then it is of the form
A) $x = f(y, p)$ B) $y = f(x, p)$ C) $y = f(x^2, py)$ D) $x = f(y^2, p)$
- iii) The differential equation of the form $y = px + f(p)$ whose general solution is $y = cx + f(c)$ is known as
A) Clairaut's equation B) Cauchy's equation C) Lagrange's equation D) None of these
- iv) The singular solution of the equation $y = px - \log p$ is
A) $y = 1 - \log x$ B) $y = 1 - \log(1/x)$ C) $y = \log x - 2x$ D) none of these
- b. Solve the equation $p^2 + p(x + y) + xy = 0$. (04 Marks)
- c. Solve the equation $xp^2 - 2yp + ax = 0$. (06 Marks)
- d. Obtain the general solution and singular solution of the equation $\sin px \cos y = \cos px \sin y + p$. (06 Marks)
- 2 a. Choose correct answers for the following : (04 Marks)
- i) The homogeneous linear differential equation whose auxiliary equation has roots 1, 1, -2 is
A) $D^3 + 3D^2 + D + 1 = 0$ B) $D^3 - 3D + 2 = 0$ C) $(D + 1)^2(D + 2) = 0$ D) $D^3 + 3D + 2 = 0$
- ii) The complementary function for the differential equation $(D^2 + 2D + 1)y = 2x + x^2$ is
A) $c_1e^{-x} + x^2c_2e^{-x}$ B) $c_1e^x + c_2e^{-x}$ C) $(c_1 + c_2)e^x$ D) $(c_1 + c_2)e^{-x}$
- iii) The particular integral of $(D^2 + a^2)y = \cos ax$ is
A) $(-x/2a)\sin ax$ B) $(x/2a)\cos ax$ C) $(-x/2a)\cos ax$ D) $(x/2a)\sin ax$
- iv) The general solution of an n^{th} order linear differential equation contains : A) at most n constants,
B) exactly n independent constants, C) at least n independent constants, D) more than n constants.
- b. Solve: $y'' - 2y' + y = xe^x \sin x$. (04 Marks)
- c. Solve: $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x} + \cos x + 4$. (06 Marks)
- d. Solve : $dx/dt = 2x - 3y$, $dy/dt = -y - 2x$ given $x(0) = 8$ and $y(0) = 3$. (06 Marks)
- 3 a. Choose correct answers for the following : (04 Marks)
- i) By the method of variation of parameters, the value of W is called
A) the Demorgan's function B) Euler's function C) Wronskian of the function D) none of these
- ii) The differential equation of the form $a_0(ax + b)^2 y'' + a_1(ax + b)y' + a_2y = \phi(x)$ is called
A) Simultaneous equation B) Legendre's equation C) Cauchy's equation D) Euler's equation
- iii) The equation $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{dy}{dx^2} + x \frac{dy}{dx} = x^3 \log x$ by putting $x = e^t$ with $D = d/dt$ reduces to
A) $(D^3 + D^2 + D)y = 0$ B) $D^3y = 0$ C) $D^3y = te^{3t}$ D) none of these
- iv) To find the series solution for the equation $4x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = 0$, we assume the solution as
A) $y = \sum_{r=0}^{\infty} a_r x^{K+r}$ B) $y = \sum_{r=0}^{\infty} a_r x^r$ C) $y = \sum_{r=0}^{\infty} a_{r+1} x^{r+1}$ D) $y = \sum (ax + b)x^r$
- b. Using the variation of parameters method, solve the equation $y'' - 2y' + y = e^x/x$. (04 Marks)
- c. Solve the equation $x^2 y'' - xy' + 2y = x \sin(\log x)$. (06 Marks)
- d. Obtain the Frobenius type series solution of the equation $x \frac{d^2y}{dx^2} + y = 0$. (06 Marks)
- 4 a. Choose correct answers for the following : (04 Marks)
- i) The partial differential equation obtained by eliminating arbitrary constants from the relation $Z = (x - a^2) + (y - b)^2$ is
A) $p^2 + q^2 = 4z$ B) $p^2 - q^2 = 4z$ C) $p + q = z$ D) $p - q = 2z$
- ii) The auxiliary equations of Lagrange's linear equation $Pp + Qq = R$ are
A) $dx/p = dy/q = dz/R$ B) $dx/P = dy/Q = dz/R$ C) $dx/x = dy/y = dz/z$ D) $dx/x + dy/y + dz/z = 0$
- iii) General solution of the equation $\frac{\partial^2 z}{\partial x \partial y} = x^2 y$ is
A) $(1/6)x^3 y^2 + f(y) + g(x)$ B) $(1/6)x^3 y^2 + f(y)$ C) $(1/6)x^3 y^3$ D) none of these
- iv) By the method of separation of variables, we seek a solution in the form
A) $X = X(x)Y(y)$ B) $Z = X + Y$ C) $Z = X^2 Y^2$ D) $Z = X/Y$
- b. Form a partial differential equation from the relation $Z = f(y) + \phi(x + y)$.
- c. Solve the equation $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.
- d. Use the method of separation of variables to solve $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$ given that $u(x, 0) = 6e^{-3x}$.

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.

PART – B

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

i) $\int_0^1 \int_0^{x^2} e^{y/x} dy dx$ is equal to: A) 1/2 B) -1/2 C) 1/4 D) 2/5

ii) The integral $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$ by changing to polar form becomes

A) $\int_{\theta=0}^{\pi/2} \int_{r=0}^\infty e^{r^2} r dr d\theta$ B) $\int_{\theta=0}^{\pi/2} \int_{r=0}^\infty e^{-r^2} r dr d\theta$ C) $\int_{\theta=0}^{\pi/2} \int_{r=0}^a e^{2r} dr d\theta$ D) none of these

iii) $\beta(3, 1/2)$ is equal to: A) 16/11 B) 16/15 C) 15/16 D) $2\pi/3$

iv) The integral $2 \int_0^\infty e^{-x^2} dx$ is: A) $\Gamma(3/2)$ B) $\Gamma(n+1)$ C) $\Gamma(-1/2)$ D) $\Gamma(1/2)$

b. Evaluate by changing the order of integration $\int_0^a \int_0^{2\sqrt{xa}} x^2 dy dx$, $a > 0$. (04 Marks)

c. Evaluate the integral $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz dz dy dx$. (06 Marks)

d. Prove that $\int_0^\infty x e^{-x^8} dx \times \int_0^\infty x^2 e^{-x^4} dx = \frac{\pi}{16\sqrt{2}}$. (06 Marks)

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

i) If $f = (5xy - 6x^2)\mathbf{i} + (2y - 4x)\mathbf{j}$ then $\int_C f \cdot dr$ where c is the curve $y = x^3$ from the points (1, 1) to (2, 8) is
A) 35 B) -35 C) $3x + 4y$ D) none of these

ii) In Green's theorem in the plane $\int_C (Mdx + Ndy) = \dots$.
A) $\iint_A \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$ B) $\iint_A \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx$ C) $\iint_A \left(\frac{\partial M}{\partial x} - \frac{\partial N}{\partial y} \right) dy dx$ D) $\iint_A \left(\frac{\partial M}{\partial x} - \frac{\partial N}{\partial y} \right) dx dy$

iii) If $\int_C f \cdot dr = 0$ then f is called: A) rational B) irrotational C) solenoidal D) rotational

iv) If all the surfaces are closed in a region containing volume V then the following theorem is applicable
A) Stoke's theorem B) Green's theorem C) Gauss divergence theorem D) none of these

b. If $f = (2x^2 - 3z)\mathbf{i} - 2xy\mathbf{j} - 4xz\mathbf{k}$, evaluate $\int_V \text{curl } f \cdot dv$ where v is the volume of the region bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$. (04 Marks)

c. Verify Green's theorem for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where c is the triangle formed by $x = 0, y = 0$ and $x + y = 1$. (06 Marks)

d. Verify the Stokes's theorem for $f = -y^3\mathbf{i} + x^3\mathbf{j}$ where s is the circular disc $x^2 + y^2 \leq 1, z = 0$. (06 Marks)

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

i) The Laplace transform of $f(t)/t$ when $L\{f(t)\} = F(s)$ is: A) $\int_0^\infty F(s)ds$, B) $\int_s^\infty F(s)ds$, C) $\int_0^\infty F(s-a)ds$, D) $\int_0^\infty F(s+a)ds$

ii) $L\{t^3 e^{2t}\} = \dots$. A) $(3!)/(s-2)^4$ B) $(3!)/(s+2)^4$ C) $3/(s-2)^4$ D) $3/(s-2)$

iii) $L\{f(t-a)H(t-a)\}$ is equal to: A) $e^{-as} L\{f(t)\}$ B) $e^{as} L\{f(t)\}$ C) $(e^{-as})/s$ D) $[L\{f(t)\}] / se^{-as}$

iv) $L\{\delta(t)\}$ is equal to: A) 0 B) -1 C) e^{-as} D) L (04 Marks)

b. Evaluate $L\{\sin t \sin 2t \sin 3t\}$. (04 Marks)

c. A periodic function of period $2\pi/\omega$ is defined by $f(t) = \begin{cases} E \sin \omega t & \text{for } 0 \leq t \leq \pi/\omega \\ 0 & \text{for } \pi/\omega \leq t \leq 2\pi/\omega \end{cases}$. Find $L\{f(t)\}$. (06 Marks)

d. Express $f(t) = \begin{cases} 2t & 0 < t \leq \pi \\ 1 & t > \pi \end{cases}$ in terms of unit step function and hence find $L\{f(t)\}$. (06 Marks)

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

i) $L^{-1}\{F(s)/s\}$ is equal to: A) $\int_0^t f(t)dt$ B) $\int_0^\infty f(t)dt$ C) $\int_0^\infty f(t-a)dt$ D) $\int_0^t f(t-a)dt$

ii) $L^{-1}\{1/(s^2 + 2s + 5)\}$ is equal to: A) $e^t \sin 2t$ B) $1/2 e^{-t} \sin 2t$ C) $1/2 e^t \cos 2t$ D) $e^{2t} \cos 2t$

iii) $f(t) * g(t)$ is defined by: A) $\int_0^t f(t-u)g(u)du$ B) $\int_0^\infty f(t)g(t)dt$ C) $\int_0^t f(t)g(t)du$ D) $\int_0^t f(u)g(u)du$

iv) $L^{-1}\{1/(s^2 + a^2)\}$ is: A) $\cos at$ B) $\sec at$ C) $\sin at$ D) $(1/a) \sin at$

b. Find $L^{-1}\{(2s-1)/(s^2 + 2s + 17)\}$. (04 Marks)

c. By employing the convolution theorem evaluation $L^{-1}\{s/(s^2 + a^2)^2\}$. (06 Marks)

d. Solve the initial value problem $y'' - 3y' + 2y = 4t + e^{3t}$, $y(0) = 1, y'(0) = -1$ using Laplace transforms. (06 Marks)
