First Semester B.E. Degree Examination, January 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 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 nth derivative of
   A) trigonometric function   B) exponential function   C) product of two algebraic functions   D) product of two functions
   ii) The nth 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 $0 \le x \le 1$ 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 $r = \dfrac{a}{1+\cos\theta}$ intersect orthogonally with the following curve : A) $r = \dfrac{b}{1-\cos\theta}$ B) $r = \dfrac{c}{1+\sin\theta}$ C) $r = \dfrac{b}{1-\sin\theta}$ D) $r = \dfrac{d}{\cos\theta}$
   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) $\dfrac{dr}{ds}$ B) $r\dfrac{d\theta}{ds}$ C) $r\dfrac{d\theta}{dr}$ D) $r\dfrac{dr}{d\theta}$
   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) $\underset{x \to \infty}{Lt}(a^{1/x}-1)x$ is of the following form   :   A) $0 \times \infty$ B) $\infty - \infty$ C) ∞^0 D) 0^∞ **(04 Marks)**

   b. Evaluate $\underset{x \to \rho/2}{\lim}(\tan x)^{\cos x}$.   **(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 $f(x,y) = \dfrac{1}{x^3} + \dfrac{1}{y^3} + \dfrac{1}{x^3+y^3}$, then $x\dfrac{\partial f}{\partial x} + y\dfrac{\partial f}{\partial y}$ is :   A) 0   B) 9   C) 1   D) $-3f$
   ii) If $x = \rho\cos\theta$, $y = \rho\sin\theta$, $z = z$ then $\dfrac{\partial(x,y,z)}{\partial(\rho,\theta,z)}$:   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 $\dfrac{\partial^2 v}{\partial r^2} + \dfrac{1}{r}\dfrac{\partial v}{\partial r} + \dfrac{1}{r^2}\dfrac{\partial^2 v}{\partial \theta^2} = 0$.   **(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 $\displaystyle\int_0^{\pi/2}\cos x \sin^{99} x\, dx$ 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) $\int\limits_a^b \sqrt{1 + \left(\dfrac{dy}{dx}\right)^2}\, dx$ B) $\int\limits_a^b \sqrt{1 + \left(\dfrac{dx}{dy}\right)^2}\, dx$ C) $\int\limits_a^b \sqrt{1 + \left(\dfrac{dx}{dy}\right)^2 + \left(\dfrac{dy}{dx}\right)^2}\, dx$ D) none of these

   iv) The value of $\int\limits_0^\pi \sin^4 x\, dx$ 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 $\int\limits_0^a x\sqrt{ax - x^2}\, dx$.   **(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 $\left[1 + \left(\dfrac{dy}{dx}\right)^2\right]^2 = c\,\dfrac{d^2y}{dx^2}$ respectively is

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

   ii) The differential equation $\left[1 + e^{x/y}\right]dx + e^{x/y}\left[1 - \dfrac{x}{y}\right]dy = 0$ 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 $\dfrac{dy}{dx} = e^{x+y}$:   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 $\dfrac{dy}{dx} = \dfrac{2x - y + 1}{x + 2y - 3}$.   **(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 $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2 + \lambda} = 1$.   **(04 Marks)**

7 a.   Choose the correct answers for the following :

   i)   The normal form of the matrix are   A) $[I_3, 0]$ B) $\begin{bmatrix} I^2 \\ 0 \end{bmatrix}$ 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) $r \le m$ B) $r \le n$ C) $r \ge n$ D) $r \ge m$ **(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^4.   **(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)**
    i)   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
    ii)   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
    iii)   When current is drawn from the Daniel cell, potential at cathode
       A) Increases   B) Decreases   C) Remains constant   D) Becomes zero
    iv)   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 Fe/Fe^{2+} (0.013M)//Ag^+(0.15M)/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)**
    i)   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
    ii)   During discharging of lead-acid battery, the concentration of sulphuric acid
       A) Increases   B) Decreases   C) Becomes zero   D) Remains constant
    iii)   Super capacitor stores
       A) Electrical energy   B) Chemical energy
       C) Heat energy   D) Both chemical and electrical energy
    iv)   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)**
    i)   The reaction that takes place during corrosion of a metal is
       A) Reduction   B) Redox   C) Oxidation   D) Precipitation
    ii)   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
    iii)   During electrochemical corrosion in a dearated 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
    iv)   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)**
    i)   In electroplating process, the overvoltage depends on
       A) Temperature   B) Current density   C) Electrolyte   D) All the above
    ii)   The anode used in electroplating of chromium is
       A) Chromium   B) Copper   C) Graphite   D) Pb-Sb
    iii)   Which of the following is essential in electroless plating?
       A) Oxidizing agent   B) Complexing agent   C) Buffering agent   D) Reducing agent
    iv)   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)
   i) 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
   ii) The knocking characteristics of petrol is expressed in terms of
      A) Octane number   B) Cetane number   C) Calorific value   D) Power number
   iii) Photovoltaic cell is
      A) Energy conversion device   B) Storage cell
      C) Rechargeable cell   D) Fuel cell
   iv) Synthesis of biodiesel involves
      A) Transesterification   B) Hydrolysis   C) Redox reaction   D) Condensation
   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)
   i) Gibb's phase rule is applicable to
      A) Heterogeneous systems   B) Heterogeneous systems in equilibrium
      C) Homogeneous systems   D) All of these
   ii) 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.
   iii) 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.
   iv) In a flame photometer, the light emitted is in
      A) IR region   B) Visible region   C) UV region   D) All of these
   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
   i) Strong acid with strong base;   ii) Strong acid and weak base. (05 Marks)

7 a. Choose the correct answers for the following: (04 Marks)
   i) Polymethyl methacrylate is commercially called
      A) Teflon   B) Bakelite   C) Plexiglass   D) Araldite
   ii) Which of the following is an adhesive?
      A) Neoprene   B) Buna-S   C) Epoxy resin   D) Polystyrene
   iii) Below its glass transition temperature, a polymer is
      A) Viscofluid   B) Soft and rubbery   C) Hard and brittle   D) Soft and brittle
   iv) Polymer composites consists of
      A) Matrix and plasticizer   B) Fibre and plasticizes   C) Fibre and matrix   D) None of these
   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)
   i) Alkalinity in water is not due to
      A) Hydroxyl ions   B) Carbonate ions   C) Bicarbonate ions   D) Hydrogen ions
   ii) 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
   iii) 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
   iv) 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)

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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, Plank'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,
          $N_A = 6.02 \times 10^{26}$/Kmole, Permitivity of vacuum $\epsilon_0 = 8.85 \times 10^{-12}$ F/m, Boltzmann constant, $K = 1.38 \times 10^{-23}$ J/K.

PART – A

1 a. Choose the correct answers for the following :   **(04 Marks)**
    i) 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
    ii) The de-Broglie wavelength of a particle at rest is
       A) Zero   B) infinite   C) h/p   D) h/v
    iii) 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
    iv) 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 MeV/C^2 has a kinetic energy 80 eV.   **(04 Marks)**

2 a. Choose the correct answers for the following :   **(04 Marks)**
    i) In quantum mechanics the energy operation is represented as:
       A) $\dfrac{8\pi^2 m}{h^2} \dfrac{\partial^2}{\partial x^2}$ B) $-\dfrac{h^2}{4\pi^2 m} \dfrac{\partial^2}{\partial x^2}$ C) $-\dfrac{h^2}{8\pi^2 m} \dfrac{\partial^2}{\partial x^2}$ D) $\dfrac{h^2}{2\pi^2 m} \dfrac{\partial^2}{\partial x^2}$
    ii) 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) $\int |\psi|^* d\tau$
    iii) If an electron moves in one dimensional box of length 2 nm, the normalization constant is,
       A) $1 (nm)^{-1/2}$ B) $2 (nm)^{-1}$ C) $\sqrt{2} (nm)^{-1}$ D) zero
    iv) 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 A°U has width of 8×10^{-5} AU. 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)**
    i) 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
    ii) The temperature dependence of classical expression for electrical resistivity of a metal is,
       A) $\rho \alpha T^{1/2}$ B) $\rho \alpha T^2$ C) $\rho \alpha \, 1/T^2$ D) $\rho \alpha \, 1/T$
    iii) The value of Fermi function in Fermi-level is at $T \neq 0$ K,
       A) zero   B) 0.5   C) 0.75   D) 1
    iv) If E_F is the Fermi energy at absolute zero, then mean energy $\overline{E}$ of electron at absolute zero is,
       A) $\overline{E} = 1.5 E_F$ B) $\overline{E} = 2/3 \; E_F$ C) $\overline{E} = 2/5 \, E_F$ D) $\overline{E} = 3/5 \; E_F$

  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)**
    i) The electric dipole moment per unit volume is,
       A) magnetization   B) dipole moment   C) electric polarization   D) electric susceptibility
    ii) Claussius – Mussoti equation does not holds for,
       A) crystalline solids   B) liquids   C) gases   D) vacuum

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 polariziability 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 $\alpha = \beta = \gamma = 90°$ 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)

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) Unsymmetrial 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) $B^4 / 48$

   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)**
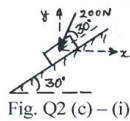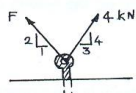

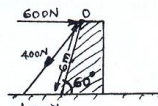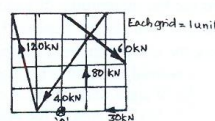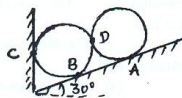Fig. Q2 (c) – (i)   Fig. Q2 (c) – (ii)   Fig. Q3 (b)   Fig. Q3 (c)   Fig. Q4 (c)
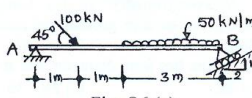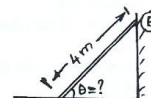
Fig. Q5 (b)   Fig. Q5 (c)   Fig. Q6 (c)   Fig. Q7 (c)   Fig. Q8 (c)

USN ☐☐☐☐☐☐☐☐☐☐   **10CIV13/23**

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,
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    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)**

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      A) $P\sqrt{2}$ B) $2\sqrt{P}$ C) 4P   D) P
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    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,
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   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
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   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
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        ii) The Lami's theorem can be applied only when number of unknown forces are:
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        iv) For a smooth spherical surface reaction acts:
             A) Horizontal to plane of contact   B) Inclined to plane of contact
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    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
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             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,
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        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 μ = 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) $B^4 / 48$
    b.   State and prove parallel axis theorem.   (06 Marks)
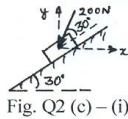   c.   Determine radius of gyration of shaded area shown in Fig. Q8 (c) about the base AB. (10 Marks)
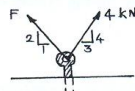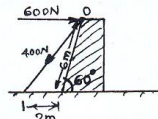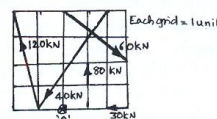

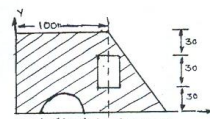Fig. Q2 (c) – (i)   Fig. Q2 (c) – (ii)   Fig. Q3 (b)   Fig. Q3 (c)   Fig. Q4 (c)
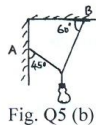

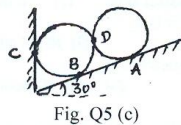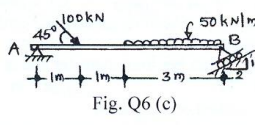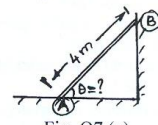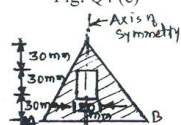Fig. Q5 (b)   Fig. Q5 (c)   Fig. Q6 (c)   Fig. Q7 (c)   Fig. Q8 (c)

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) Reminder   (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)**

d. Determine the value of a 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 O. 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? printf ("hello": printf ("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 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)**
　　　i)　　Hydro energy is considered as _____,
　　　　　A) Tidal energy　　　B) Heat energy　　　C) Indirect solar energy　D) Ocean energy
　　　ii)　The primary processes of solar energy are:
　　　　　A) Heliochemical process　B) Helioelectrical process　C) Heliothermal process　D) All of these
　　　iii)　Lanchashire boiler is a _____ boiler,
　　　　　A) Water tube　　　B) Fire tube　　　C) Gas tube　　　D) Air tube
　　　iv)　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 KJ/kgK. From steam table, at 7 bar,
　　　h_f = 679.1 KJ/kg, h_{fg} = 2064.9 KJ/kg, T_{sat} = 165°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)**
　　　i)　　It is an example of reaction turbine,
　　　　　A) De-Laval turbine　　B) Kaplan turbine　　C) Flow turbine　　D) Pelton wheel
　　　ii)　Open cycle gas turbine uses _____ as the working substance,
　　　　　A) Ammonia　　　B) Nitrogen　　　C) Air　　　D) CO_2
　　　iii)　_____ is example for reaction water turbine,
　　　　　A) Pelton wheel　　B) Francis turbine　　C) Kaplan turbine　　D) Both B and C
　　　iv)　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)**
　　　i)　　The motion of a piston is _____,
　　　　　A) Rotory　　　B) Oscillatory　　　C) Rectilinear　　　D) Circular
　　　ii)　Diesel engine is also called as _____,
　　　　　A) 4-stroke engine　　B) 2-stroke engine　　C) C.I. engine　　D) S.I.engine
　　　iii)　The power measured in the crankshaft of engine is _____,
　　　　　A) Indicated power　　B) Brake power　　C) Horse Power　　D) Torque
　　　iv)　_____ 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)**
　　　i)　　_____ is the heart of the refrigerator,
　　　　　A) Compressor　　　B) Condenser　　　C) Expansion valve　　　D) Evaporator
　　　ii)　The ratio of heat absorbed in a system to work supplied is _____,
　　　　　A) Refrigeration effect　　B) COP　　C) Ton of refrigeration　　D) Coding effect
　　　iii)　In a refrigerator exchange of heat takes place in _____,
　　　　　A) Condenser　　　B) Evaporator　　　C) Compressor　　　D) Both A and B.
　　　iv)　_____ 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)**
        i)   _____ object are produced in a engine lathe.
             A) Plane objects   B) Curved objects   C) Circular objects   D) None of these
        ii) Taper turning is an operation of producing _____ on the work piece.
             A) Tapping   B) Reaming   C) Taper   D) Boring
        iii) 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
        iv) _____ 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)**
        i)   Milling cutter is a _____,
             A) Multipoint cutting tool B) Abrasive cutter C) Single point cutting tool D) Metal removing machine
        ii) Milling is a _____,
             A) Metal removal process B) Metal cutting processor   C) Metal joint process   D) None of these
        iii) _____ is a natural abrasive mineral consists of aluminium oxide.
             A) Diamond   B) Corundum   C) Emery   D) Aluminium Nitrate
        iv) 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)**
        i)   Welding is a _____ process used for metals,
             A) Metallurgical joining B) Forged forming   C) Mechanical joining   D) Adhesive bonding
        ii) Gas welding is a _____ method of joining two metals.
             A) Fission   B) Fusion   C) Gas reaction   D) Oxidizing
        iii) Lubricants are used to reduce the _____ in machines.
             A) Efficiency   B) Effectiveness   C) Friction   D) Torque
        iv) 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)**
        i)   The _____ motion is the simplest form of transmitting power with minimum losses.
             A) Rotational   B) Rectilinear   C) Oscillatory   D) None of these
        ii) _____ is also called as positive drive mechanisms.
             A) Belt drive   B) Chain drive   C) Gear drive   D) Both B and C.
        iii) _____ 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
        iv) 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 15Ω resistor is 3A, find (i) current in 20Ω & 30Ω 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 – j8Ω 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 μP 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 Ω. 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 Ω, 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 clip 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 function 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} = 200mA.   **(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 α = 0.95, than 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 = 12.42mA and I_B = 200μA, find i) IE   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} = 15V , R_1 = 6.8kΩ , R_2 = 3.3kΩ , R_C = 900Ω , R_E = 900Ω and h_{FE} = 50, V_{BE} = 0.7V. 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 ration 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)**

1 of 2

PART – B

5 a. Choose the correct answer : (04 Marks)
   i)   In an oscillator we use _____ feedback.
        (A) Positive   (B) Negative   (C) Neither   (D) Unity gain
   ii) The two Barkhausen conditions to be satisfied by oscillator are _____
        (A) $|A\beta| \leq 1$, shift $= 0^0$ (B) $|A\beta| \geq 1$, shift $= 0^0$ (C) $|A\beta| \geq 1$, shift $= 90^0$ (D) $|A\beta| \geq$, shift $= 180^0$
   iii) 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
   iv) $f_1(f_L)$ and $f_2(f_H)$ are known as _____ frequencies
        (A) half   (B) half power   (C) decibel   (D) mid band
  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)
   i)   The ideal value of CMRR is _____
        (A) 90dB   (B) 2×10^5 (C) 0   (D) ∞
   ii) The PSRR is generally measured in _____
        (A) dB   (B) mV/V   (C) μV/V   (D) V/μS
   iii) The gain of voltage follower is _____
        (A) zero   (B) infinite   (C) negative   (D) unity
   iv) 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
  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)
   i)   Over modulation exists when modulation index is _____
        (A) 1   (B) 0   (C) > 1 (D) < 1.
   ii) 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) $P_T = P_C (1+(m^2/2))$
   iii) 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) $m^2E_C^2/4$
   iv) Hexadecimal and octal numbering systems are similar for the first
        (A) 9 digits   (B) 8 digits   (C) 7 digits   (D) 6 digits.
  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)
   i)   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.
   ii) Which of these are universal gates?
        (A) only NOR   (B) only NANS   (C) Both NOR & NAND   (D) NOT, AND, OR
   iii) 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
   iv) A half adder has _____ inputs and _____ outputs.
        (A) 1, 1   (B) 1, 2   (C) 2, 1   (D) 2, 2
  b. State Define Morgan's theorems. (04 Marks)
  c. Simplify the following Boolean expressions : i) $Y = AB + \overline{A} C + BC$ ii) $Y = (A + \overline{B} + \overline{C})(A + \overline{B} + C)$
      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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USN | | | | | | | | | | | - | **Question Paper Version : D**

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. Which of the state having highest members in Lok Sabha?
   a) Andhra Pradesh   b) Madhya Pradesh   c) Uttar Pradesh   d) Karnataka
2. The upper house is called: a) Lok Sabha   b) Rajya Sabha   c) Vidhana Sabha   d) None of these
3. Who appoints the chief election commissioner?
   a) Prime Minister   b) President   c) Parliament   d) A. I. C. T. E
4. The chief justice of India is appointed by: a) Parliament   b) Government   c) Vice President   d) President
5. The smoothing of irregularities to make data to look extremely precise done researches called
   a) Trimming   b) Cooking   c) Plagiarism   d) Forging
6. The greatest impediment to responsibility is
   a) Rampant corruption   b) Self interest   c) Interference by politicians   d) Interference by higher officials
7. Conflict of interest may be:
   a) Actual   b) Imaginary   c) Produced   d) True
8. The patent holder does not allow other to use potential information for years: a) 10   b) 15   c) 18   d) 20
9. Fear is _____ to responsibility: a) a way to shift   b) an impediment   c) conflict   d) both a and c
10. Risk estimation can be done by using: a) cooking   b) trimming   c) event tree   d) both a and b
11. Tendency of shifting responsibility will logically come down if there is
    a) Group thinking   b) Microscopic vision   c) Fear   d) Both a and b
12. Considering an engineering profession as building then, is its foundation of
    a) honesty   b) creativity   c) imagination   d) both b and c
13. Which of the following is not conflict of interest as applied to making judgment?
    a) Actual   b) Potential   c) Apparent   d) Virtual
14. The formulae of a soft drink is an example of: a) trade secret   b) patent   c) copyright   d) trade marks
15. Which of the following is not the concepts of responsibility?
    a) Minimalist   b) Utilitariansim   c) Reasonable care   d) Good works
16. The president of India can be removed from his office only on grounds of
    a) Accepting bribe   b) Disobedience of the parliament
    c) Violating the constitution   d) Showing favours to his party members
17. The disputes regarding the election of the president of India are decided by
    a) The Supreme Court of India   b) The Parliament   c) The Lok Sabha   d) The High Court

18. Who appoints the advocate general?: a) Governor   b) President   c) Prime Minister   d) Chief Minister

19. The first president election held during the year: a) 1950   b) 1947   c) 1951   d) 1952

20. The Indian constitution the subject of administration have been divided into
    a) Two list   b) Three list   c) Four list   d) Five list

21. The financial emergency under article: a) 352   b) 354   c) 360   d) 364

22. National emergency was proclaimed first time during the year: a) 1952   b) 1956   c) 1962   d) 1971

23. How many emergencies are there? : a) One   b) Two   c) Three   d) Four

24. The term of Lok Sabha and legislative assemblies the period was extended for 6 years in amendment
    a) 26th b) 42nd c) 44th d) 46th

25. Reservation for Anglo Indian in Karnataka legislative assembly: a) 1   b) 2   c) 3   d) 4

26. How many members retired in legislative council for every two years? a) 1/4   b) 1/3   c) 1/5   d) 1/6

27. How many members are there in Karnataka Legislative Assembly?:   a) 120   b) 220   c) 225   d) 235

28. The Council Minister and Prime Minister should not exceed the total strength of the parliament
    a) 5%   b) 10%   c) 12%   d) 15%

29. The Prime Minister shall be selected from
    a) President   b) Vice president   c) Majority party of Lok Sabha members   d) None of these

30. The Vice President is elected by electoral college consist of
    a) Adult franchise of the constituency   b) Lok Sabha and State Assembly
    c) Rajya Sabha members   d) Lok Sabha and Rajyasabha members

31. How many articles included while making Indian Constitution?: a) 300   b) 368   c) 395   d) 448

32. The Indian council Act, 1909 is called as
    a) Montague and chelmesford reforms   b) Minto Morley reforms   c) Cripps mission Act   d) British Act

33. British parliament passed the Indian independence Act on
    a) 15th August 1947   b) 18th July 1947   c) 26th January 1950   d) 14th August 1947

34. The Act of 1935 abolished:
    a) dyarchy in the provinces   b) provincial autonomy   c) dyarchy at the centre   d) None of these

35. Indian constitution is flexible that it: a) Cannot be amended easily   b) Can be amended only after under going a special procedure   c) Can be amended easily   d) Does not allow frequent changes

36. For how many years, months and days did the constituent assembly work on the framing of the constitution of India
    a) 2 years 11 months and 18 days   b) 13 years 2 months and 16 days
    c) 4 years 2 months and 18 days   d) 1 year 11 months and 15 days

37. Equality of opportunity in matters of public employment under article: a) 14   b) 15   c) 16   d) 19

38. Abolition of untouchability under article: a) 17   b) 19   c) 21   d) 32

39. Classification of fundamental rights part: a) I   b) II   c) III   d) IV

40. Unnikrishnan V state of Andhra Pradesh AIR 1993 SCC 645 regarding: a) Public interest litigation   b) Abolish of capitation fee   c) Smoking in public place   d) Notice pollution due to blaring of music during religion activities

41. Which of the following words were added to the preamble of the Indian constitution by the 42nd amendment?
    a) Secular   b) Socialist   c) Integrity   d) All of these

42. The ultimate source of authority of India
    a) The government   b) The constitution   c) The parliament   d) The people

43. According to the marriage Act of 1954 the age is fixed at 21 years for men and for women.
    a) 16 years   b) 17 years   c) 18 years   d) 21 years

44. Which of the following is no longer a fundamental right?
    a) Right to freedom of religion b) Right to equality   c) Right to liberty   d) Right to property

45. The concept of welfare state is included in the constitution of India in the
    a) Preamble   b) Fundamental rights   c) Fourth schedule   d) The directive principles of state policy

46. The directive principles of state policy under article: a) 16 to 30   b) 31 to 51   c) 61 to 76   d) None of these

47. How many fundamental duties are there? : a) 5   b) 6   c) 10   d) 11

48. The fundamental duties has been inserted during the tenureship of
    a) Dr. Ambedkar   b) Gandhiji   c) Dr. Babu Rajendra Prasad   d) Indira Gandhi

49. The President of India is
    a) The real ruler of India   b) The constitutional head of the state
    c) The head of the state as well as the government   d) The leader of majority party which forms the government.

50. The president of India is elected for: a) 3 years   b) 4 years   c) 5 years   d) 6 years

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USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Version : B

First/Second Semester B.E Degree Examination, January 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. Which of the following is not a greenhouse gas?
   a) CO_2　　　　b) CH_4　　　　c) CFC　　　　d) H_2

2. Ionizing radiations of ecological importance are
   a) α - rays　　b) β - rays　　c) γ - rays　　d) all of these

3. The proportion of methane in biogas is
   a) 20 to 30%　　b) 10 to 30%　　c) 60 to 70%　　d) 80 to 90%

4. Which is not a natural disaster?
   a) Cyclone　　b) Nuclear explosion　　c) Earthquake　　d) Volcano

5. Landslides are caused by
   a) earthquakes　　b) dam building　　c) mining　　d) all of these

6. In the world's population, India accounts for
   a) 10%　　b) 5%　　c) 25%　　d) 16%

7. World Environmental Day is celebrated on
   a) 5th June　　b) 11th June　　c) 12th January　　d) 8th September

8. Excess fluorides in drinking water is likely to cause
   a) blue babies　　b) flurosis　　c) taste and odour　　d) intestinal irritation

9. The leader of Chipko movement is
   a) Sunderlal Bahuguna　　b) Medha Patkar　　c) Vandana Shiva　　d) Suresh Heblikar

10. E.I.A. can be expanded as
    a) Environment and Industrial Act　　b) Environment and Impact Activities
    c) Environment Impact Assessment　　d) Environmentally Important Activity

11. Environmental Education is targeted to
    a) general public　　b) professional social groups　　c) technicians and scientists　　d) all of these

12. Bhopal gas tragedy caused due to leakage of
    a) Methyl Iso Cyanate (MIC)　　b) Suplhur dioxide　　c) Mustard gas　　d) Methane

13. Which state is having highest women literacy rate in India?
    a) Karnataka　　b) Punjab　　c) Rajasthan　　d) Kerala

14. The virus that causes AIDS is
    a) HIV　　b) TMV　　c) HMV　　d) none of these

15. Kalahazar is spread by
    a) tape worms　　b) rats　　c) mosquitoes　　d) sand flies

16. Energy flow in any ecosystem is always
    a) bidirectional　　b) unidirectional　　c) multidirectional　　d) none of these

17. Sundarbans is the name of place in
    a) Assam　　b) West Bengal　　c) Karnataka　　d) All of these

18. Mangrove forests are seen in
    a) Mumbai　　b) Nicobar Islands　　c) West Bengal　　d) All of these

19. Rearing fish is called
    a) pisciculture　　b) sericulture　　c) fishiculture　　d) horticulture

20. Western Ghats are not located in
    a) North-East India　　b) Maharastra　　c) Peninsular India　　d) Gujarat

21. Radiation is a health hazard because it leads to
    a) typhoid　　b) cancer　　c) colour blindness　　d) pneumonia

22. Which of these gases causes air pollution?
    a) Nitrogen　　b) Hydrogen　　c) Water vapour　　d) Carbon monoxide　　-B1-

23. Kitchen Wastes contain
a) non-biodegradable pollutants   b) biodegradable pollutants   c) radioactive pollutants   d) none of these

24. Water pollution is caused by
a) sewage   b) industrial effluents   c) discharge from forms   d) all of these

25. D.D.T. pollutes
a) air   b) water   c) soil   d) all of these

26. Which of the following is not a biodegradable pollutant?
a) Plastic   b) Skins of vegetables and fruits   c) Dry leaves   d) Paper

27. Minamata disease is caused by
a) cadmium   b) strontium   c) mercury   d) uranium

28. BOD stands for
a) Biochemical Oxygen Demand   b) Biological Oxygen Demand
c) Biogeochemical Oxygen Demand   d) None of these

29. Greenhouse effect is caused by excess of
a) CO_2 b) H_2 c) He   d) O_2

30. Photochemical smog is caused by
a) $PAN + O_2$ b) $PAN + O_3$ c) $O_3 + O_2$ d) $PAN + CO_2$

31. The percentage of water accounted by oceans and seas, is
a) 90%   b) 87%   c) 97%   d) 99%

32. Salim Ali was an expert in
a) agricultural sciences   b) rainwater harvesting   c) ornithology   d) environmental law

33. Which of the following diseases is not spread by water?
a) diarrhea   b) chickenpox   c) cholera   d) dysentery

34. D.D.T. is a
a) fungicide   b) pesticide   c) fertilizer   d) disinfectant

35. Which of the following waste material is degradable?
a) plastic   b) metal   c) glass   d) paper

36. Coal is a
a) renewable source of energy   b) inexhaustible source of energy
c) non-renewable source of energy   d) none of these

37. Which of the following is a non-polluting source of energy?
a) Coal   b) Petroleum   c) Natural gas   d) Solar energy

38. Deforestation is majorly caused by
a) mining   b) overgrazing   c) dam building   d) all of these

39. Major dams may cause
a) earthquakes   b) hurricanes   c) storms   d) cyclones

40. Maximum usage of water is in the filed of
a) industries   b) homes   c) agriculture   d) none of these

41. Medha Patkar is famous for
a) Chipko Movement   b) Narmada Bachao Andolan   c) Green Revolution   d) Silent Valley Project

42. Examples of renewable resources are
a) wind energy   b) solar energy   c) tidal energy   d) all of these

43. Biogas is made up mostly of
a) hydrogen   b) carbon dioxide   c) ethane   d) methane

44. Pyramid of numbers in a pond ecosystem is always
a) inverted   b) erect   c) irregular   d) none of these

45. Cycling of materials in the biosphere is called
a) biochemical cycle   b) biophysical cycle   c) biogeochemical cycle   d) geochemical cycle

46. Pyramid of energy is always
a) inverted   b) erect   c) rectangular   d) none of these

47. Herbivores are
a) primary producers   b) consumers   c) decomposers   d) all of these

48. The sequence of organisms in a food chain is
a) consumer → producer → decomposer   b) decomposer → consumer → producer
c) producer → decomposer → consumer   d) producer → consumer → decomposer

49. Which of the following is a top carnivore?
a) Tiger   b) Crocodile   c) Hawk   d) All of these

50. One method of Nitrogen fixation in nature is by
a) thunder   b) rain   c) lightning   d) storm

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First Semester B.E. Degree Examination, December 2012

COMPUTER AIDED ENGINEERING DRAWING

Time: 3 Hours   **(COMMON TO ALL BRANCHES)**   Max. Marks: 100

Note: 1. Answer three full questions   2. Use A4 sheets supplied
           3. Draw to actual scale   4. Missing data may be assumed

1. a. A point is 30 mm in front of VP, 20 mm above HP & 25 mm in front / behind / from LPP. Draw its Projections and name the side view.   **(10 Marks)**

    b. The top view of a line PQ is 70 mm and front view is 60 mm long. The end Q is nearer to both HP and VP than the end P and is 15 above HP and 20 mm in front of VP. Draw the projections of the line if the distance between projectors is 50 mm.   **(20 Marks)**

or

1   A 30° -60° setsquare of 60mm longest side is so kept such that the longest side is in HP, making an angle of 30° with VP. The set square itself is inclined at 45° to HP. Draw the projections of the setsquare.   **(30 Marks)**

2. A square prism 35 mm sides of base and 60 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40° and appears to be inclined to VP at 45°.   **(40 Marks)**

3. A hexagonal pyramid of sides 35mm and altitude 65mm is resting on HP on its base with two of the base sides perpendicular to VP. The pyramid is cut by a plane inclined at 30° to HP and perpendicular to VP and is intersecting the axis at 30mm above the base. Draw the development of the remaining portion of the pyramid.   **(30 Marks)**

or

3. A hemisphere of diameter 50mm is centrally resting on top of a square prism of base side 60mm and height 30mm such that the curved surface of hemisphere is touching the top face of the prism. Draw its isometric projections.   **(30 Marks)**

First Semester B.E. Degree Examination, December 2012

COMPUTER AIDED ENGINEERING DRAWING

Time: 3 Hours   **(COMMON TO ALL BRANCHES)**   Max. Marks: 100

Note: 1. Answer three full questions   2. Use A4 sheets supplied
              3. Draw to actual scale   4. Missing data may be assumed

1. a. The point P is 45 mm above HP, 60 mm behind VP and 30 mm from RPP. Draw the three principles view of the point. Also state the quadrant in which it lies.
(10 Marks)

   b. A line AB 60 mm long has one of its extremities 20 mm in front of VP and 15 mm above HP. The line is inclined at 25^0 to HP and 40^0 to VP. Draw its top and front views.
(20 Marks)

or

1.   The top view of a square lamia of side 30mm is a rectangle of sides 30mm x 20mm with the longer side of the rectangle being parallel to both HP and VP. Draw the top and front views of the square lamina. What is the inclination of the surface of the lamina with HP and VP?
(30 Marks)

2. A square prism 35 mm sides of base and 60 mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis is inclined to HP at 45° and VP at 30°.
(40 Marks)

3. A regular pentagonal prism of height 60mm and base edge 30mm rests with its base on HP. The vertical face closest to VP is 30° to it. Draw the development of the truncated prism with its truncated surface inclined at 60° to its axis and bisecting it.   **(30 Marks)**

or

3. A hemisphere diameter 50mm is resting on its curved surface centrally on the top face of frustum of a rectangular pyramid base-80mmx60mm and top-60mmx40mm, height 55mm. Draw the isometric projection of the combination.
(30 Marks)

First Semester B.E. Degree Examination, December 2012

COMPUTER AIDED ENGINEERING DRAWING

Time: 3 Hours   **(COMMON TO ALL BRANCHES)**   Max. Marks: 100

Note: 1. Answer three full questions   2. Use A4 sheets supplied
   3. Draw to actual scale   4. Missing data may be assumed

1. a. A point A is 20 mm above HP & 25 mm in front of VP. Another point B is 25 mm behind VP and 40 mm below HP. Draw their projections when the distance between their projectors parallel to XY line is zero mm. Add the right side view only to point B.
    (10 Marks)

    b. A line PQ measures 80 mm in length. The point P is above HP and in front of VP by 20 mm and 30 mm respectively. The distance between the end projectors is 50 mm. the line is inclined to VP by 30°. Draw the projections of the line and specify its true inclination with HP.   **(20 Marks)**

or

1   A pentagonal lamina of edges 25mm is resting on VP with one of its sides such that the surface makes an angle of 60° with VP. The edge on which it rests is inclined at 45° to HP. Draw its projections.   **(30 Marks)**

2   A hexagonal prism 25 mm sides of base and 50 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40° and appears to be inclined to VP at 45°.   **(40 Marks)**

3   A regular pentagonal prism of height 60mm and base edge 30mm rests with its base on HP. The vertical face closest to VP is 30° to it. Draw the development of the truncated prism with its truncated surface inclined at 60° to its axis and bisecting it.   **(30 Marks)**

or

3. A hemisphere diameter 50mm is resting on its curved surface centrally on the top face of frustum of a rectangular pyramid base-80mmx60mm and top-60mmx40mm, height 55mm. Draw the isometric projection of the combination.   **(30 Marks)**

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) Glairaut'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 nth 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: $\dfrac{d^2y}{dx^2} - 4\dfrac{dy}{dx} + 4y = e^{2x} + \cos x + 4$.   (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 $x^3\dfrac{d^3y}{dx^3} + 3x^2\dfrac{dy}{dx^2} + x\dfrac{dy}{dx} = x^3 \log x$ 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 $4x\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + y = 0$, we assume the solution as
        A) $y = \sum\limits_{r=0}^{\infty} a_r x^{K+r}$ B) $y = \sum\limits_{r=0}^{\infty} a_r x^r$ C) $y = \sum\limits_{r=0}^{\infty} a_{r+1} x^{r+1}$ 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 $x^2y'' - xy' + 2y = x \sin(\log x)$.   (06 Marks)
   d. Obtain the Frobenius type series solution of the equation $x\dfrac{d^2y}{dx^2} + y = 0$.   (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 $\dfrac{\partial^2 z}{\partial x \partial y} = x^2 y$ is
        A) $(1/6)x^3y^2 + f(y) + g(x)$ B) $(1/6)x^3y^2 + f(y)$ C) $(1/6)x^3y^3$ 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) $Z = X^2Y^2$ D) $Z = X/Y$

   b. Form a partial differential equation from the relation $Z = f(y) + \phi(x + y)$.
   c. Solve the equation $(x^2 - y^2 - z^2)p + 2xy q = 2xz$.
   d. Use the method of separation of variables to solve $\dfrac{\partial u}{\partial x} = 2\dfrac{\partial u}{\partial t} + u$ given that $u(x, 0) = 6e^{-3x}$.

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PART – B

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

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

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

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

iii) $\beta(3, \frac{1}{2})$ 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 $\int_0^a \int_0^{2\sqrt{xa}} x^2 dydx$, $a > 0$.   (04 Marks)

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

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

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

i)   If $f = (5xy - 6x^2)i + (2y - 4x)j$ then $\int_c f.dr$ 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) = $ _____.

A) $\iint_A \left(\dfrac{\partial N}{\partial x} - \dfrac{\partial M}{\partial y} \right) dxdy$ B) $\iint_A \left(\dfrac{\partial N}{\partial x} - \dfrac{\partial M}{\partial y} \right) dx$ C) $\iint_A \left(\dfrac{\partial M}{\partial x} - \dfrac{\partial N}{\partial y} \right) dydx$ D) $\iint_A \left(\dfrac{\partial M}{\partial x} - \dfrac{\partial N}{\partial y} \right) dxdy$

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 $f = (2x^2 - 3z)i - 2xy\hat{j} - 4x\hat{k}$, evaluate $\int_v curl \, f \, dv$ 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 $f = -y^3 \hat{i} + x^3 \hat{j}$ where s is the circular disc $x^2 + y^2 \le 1$, $z = 0$.   (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}] = $ _____.   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

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

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

d. Express $f(t) = \begin{cases} 2t & 0 < t \le \pi \\ 1 & t > \pi \end{cases}$ 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) $\frac{1}{2} e^{-t} \sin 2t$ C) $\frac{1}{2} e^t \cos 2t$ D) $e^2 t \cos 2t$

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) $\int_0^\infty f(u)g(u)du$

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)

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