USN ☐☐☐☐☐☐☐☐☐☐   **06MAT11**

First Semester B.E. Degree Examination, December 2012
Engineering Mathematics – I

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   Choose your answers for the following :   **(04 Marks)**
     i)   If $y = \sin^2 x$, then y_n is

        A) $-2^{n-1}\cos\left(2x + \dfrac{n\pi}{2}\right)$ B) $2^{n-1}\cos\left(2x + \dfrac{n\pi}{2}\right)$

        C) $2^{n-1}\sin\left(2x + \dfrac{n\pi}{2}\right)$ D) $-2^{n-1}\sin\left(2x + \dfrac{n\pi}{2}\right)$

     ii)   If $y = x\log(x+1)$ then y_n is

        A) $\dfrac{(-1)^{n-1}(n-1)!\,x}{(x+1)^{n+1}}$ B) $\dfrac{(-1)^{n-1}(n-2)!\,(x+n)}{(x+1)^{n}}$

        C) $\dfrac{(-1)^{n-1}(n-2)!\,(x+n)}{(x+1)}$ D) None of these.

     iii)   The angle of intersection of the curves $r = \dfrac{a\theta}{1+\theta}$, $r = \dfrac{a}{1+\theta^2}$ is

        A) $\cos^{-1} 3$ B) $\cot^{-1} 3$ C) $\tan^{-1}\dfrac{1}{3}$ D) $\tan^{-1} 3$.

     iv)   Pedal equation of the curve $r^m \cos m\theta = a^m$ is

        A) $r^{m-1} = a^m$ B) $p^2 = a^m r^{m-1}$ C) $pr^{m-1} = a^m$ D) $p^2 = r^m a^m$

   b.   Find y_n, if $y = e^{-3x}\cos^3 x$ **(04 Marks)**
   c.   If $y^{1/m} + y^{-1/m} = 2x$, prove that $(x^2 - 1)y_{n+2} + (2n+1)xy_{n+1} + (n^2 + m^2)y_n = 0$ **(06 Marks)**
   d.   Find the angle between the curves $r = a\log\theta$, $r = a / \log\theta$.   **(06 Marks)**

2   a.   Choose your answers for the following :   **(04 Marks)**
     i)   If $u = \dfrac{x^2}{y}$, then $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y}$ is equal to

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

     ii)   If u is a homogeneous function of order n is x&y then $x^2\dfrac{\partial^2 u}{\partial x^2} + 2xy\dfrac{\partial^2 u}{\partial x \partial y} + y^2\dfrac{\partial^2 u}{\partial y^2}$ is

        A) nu   B) $n^2 u$ C) $n(n-1)u$ D) $n(n+1)u$.

     iii)   If $x = r\cos\theta$, $y = r\sin\theta$ then $\dfrac{\partial(x,y)}{\partial(r,\theta)}$ is equal to

        A) 1   B) r   C) $\dfrac{1}{r}$ D) 0

iv) $\dfrac{\delta x}{x}$ is called

  A) Absolute error B) Relative error C) Percentage error D) Absolute & relative error.

b. If $u = \operatorname{cosec}^{-1}\left[\dfrac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}\right]^{1/2}$, prove that

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{12}\left[\frac{13}{12} + \frac{\tan^2 u}{12}\right]$$ (04 Marks)

c. If $u = \dfrac{yz}{x}$, $v = \dfrac{zx}{y}$, $w = \dfrac{xy}{z}$, show that $\dfrac{\partial(u, v, w)}{0(x, y, z)} = 4$ (06 Marks)

d. If the H.P. required to propel a steamer varies as the cube of the velocity and square of the length prove that a 3% increase in velocity and 4% increase in lengths will require an increase about 17% H.P. (06 Marks)

3 a. Choose your answers for the following : (04 Marks)

i) $\displaystyle\int_{0}^{\pi} \sin^7 x \, dx$ is equal to

  A) zero B) $\dfrac{32\pi}{35}$ C) $\dfrac{32}{35}$ D) $\dfrac{35\pi}{35}$

ii) $\displaystyle\int_{0}^{\infty} \dfrac{dx}{(1+x^2)^{7/2}}$ is equal to

  A) $\dfrac{8}{15}\pi$ B) $\dfrac{8}{15}$ C) $\dfrac{4}{15}$ D) $\dfrac{15}{8}$

iii) The shape of the curve $r^2 = a^2 \cos 2\theta$ is
  A) Three leaved B) cycloid C) cardiode D) Lemnisate of Bernoulli
iv) The curve $y^2(a - x) = x^2 (a + x)$ passes through
  A) origin B) Node C) x-axis D) y-axis

b. If $I_{m,n} = \displaystyle\int_{0}^{\pi/2} \sin^m x \cos^n x \, dx$ $(m > 0, n > 0)$; show that $I_{m,n} = \dfrac{n-1}{m+n} I_{m, n-2}$ (04 Marks)

c. Evaluate $\displaystyle\int_{\theta}^{a} (x^2 + a^2)^{5/2} \, dx$ (06 Marks)

d. Trace the curve $r = a \sin 3\theta$ (06 Marks)

4 a. Choose your answers for the following : (04 Marks)
  i) Length of one arch of the cyliod $x = a(t - \sin t)$, $y = a(1 - \cos t)$ is
  A) $- 8a$ B) $8a$ C) $\sqrt{8}\, a$ D) $\dfrac{1}{8a}$

  ii) Surface area of revolution about x-axis is s =

  A) $2\pi \displaystyle\int_{a}^{b} y\sqrt{1 + \left(\dfrac{dy}{dx}\right)^2}\, dx$ B) $\pi \displaystyle\int_{a}^{b} \sqrt{1 + \left(\dfrac{dy}{dx}\right)^2}\, dx$

  C) $2\pi \displaystyle\int_{a}^{b} y\sqrt{1 + \left(\dfrac{dy}{dx}\right)^2}\, dy$ D) $\pi \displaystyle\int_{a}^{b} \sqrt{1 + \left(\dfrac{dx}{dy}\right)^2}\, dy$

  iii) Area of the cardiode $r = a(1 + \cos\theta)$ is

  A) $\displaystyle\int_{0}^{\pi} r^2 \, d\theta$ B) $2\displaystyle\int_{0}^{\pi} r \, d\theta$ C) $\dfrac{1}{2}\displaystyle\int_{0}^{\pi/2} r\cos\theta \, d\theta$ D) $2\displaystyle\int_{0}^{\pi}\cos\theta \, d\theta$

iv) Length of the loop of the curve $x = t^2$, $y = t - t^3/3$ is

    A) $2\sqrt{3}$ B) $-4\sqrt{3}$ C) $\frac{1}{4}\sqrt{3}$ D) $4\sqrt{3}$

b. Find the area enclosed by the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$.   **(04 Marks)**

c. Find the area of surface of he solid generated when the cardioid $r = a(1 + \cos\theta)$ revolved about the initial line.   **(06 Marks)**

d. Prove that $\displaystyle\int_0^{\pi/2} \frac{\log(1 + y\sin^2 x)}{\sin^2 x} = \pi\left[\sqrt{1+y} - 1\right]$ **(06 Marks)**

PART – B

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

    i) Homogeneous differential equation can be reduced to a differential equation by substitution

      A) $x + y = v$ B) $y = vx$ C) $xy = v$ D) $x - y = v$.

    ii) $(1 + xy)y\,dx + (1 - xy)x\,dy = 0$ then I.F. is

      A) $2x^2y^2$ B) x^2y^2 C) $\frac{1}{2x^2y^2}$ D) $\frac{2}{x^2y^2}$

    iii) The equation $y - 2x = c$ represents the orthogonal trajectories of the family

      A) $y = ae^{-2x}$ B) $x^2 + 2y^2 = a^2$ C) $xy = a$ D) $x + 2y = a$

    iv) The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \tan\frac{y}{x}$ is

      A) $\sin\frac{y}{x} = c$ B) $\sin\frac{y}{x} = cx$ C) $\cos\frac{y}{x} = cx$ D) $\cos\frac{y}{x} = c$

b. Solve $(x - y\log y + y\log x)dx + x(\log y - \log x)dx = 0$ **(04 Marks)**

c. Solve $x^3\frac{dy}{dx} - x^2y = -y^4\cos x$ **(06 Marks)**

d. Test for self orthogonality $r^n = a\sin n\theta$.   **(06 Marks)**

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

    i) The series $\frac{2}{1^2} - \frac{3}{2^2} + \frac{4}{3^2} - \frac{5}{4^2} + \ldots\ldots$ is

      A) Conditionally convergent   B) Absolutely convergent

      C) Divergent   D) None of these.

    ii) $\sum\left[1 + \frac{1}{n}\right]^{-n^2}$ is

      A) Oscillatory   B) Convergent   C) Divergent   D) Absolutely convergent

    iii) By Raabe's test Σu_n is convergent if $\displaystyle\lim_{n \to \infty}\left[\frac{u_n}{u_{n+1}} - 1\right]$

      A) Equal to one   B) Greater than one   C) Less than one   D) None of these.

    iv) $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5}$ by Lebnitz's test

      A) Monotonic decreasing   B) Divergence

      C) Oscillatory   D) Convergency

b. Test the series for convergence, $\frac{3}{4} + \frac{3.6}{4.7} + \frac{3.6.9}{4.7.10} + \ldots\ldots\ldots$ **(04 Marks)**

c. Find the nature of the series $\sum_{n=1}^{\infty}\left(1-\frac{3}{n}\right)^{n^2}$ (06 Marks)

d. Test the series $x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$ for absolute convergence. (06 Marks)

7 a. Choose your answers for the following : (04 Marks)
   i) The sum of the direction cosines of a straight line is
      A) zero   B) one   C) constant   D) None of these.
   ii) The equation of a straight line parallel to the x-axis is given by
       A) $\frac{x-a}{1} = \frac{y-b}{1} = \frac{z-c}{1}$ 　　　　　　 B) $\frac{x-a}{0} = \frac{y-b}{1} = \frac{z-c}{1}$
       C) $\frac{x-a}{0} = \frac{y-b}{0} = \frac{z-c}{1}$ 　　　　　　 D) $\frac{x-a}{1} = \frac{y-b}{0} = \frac{z-c}{0}$
   iii) A line makes angles α, β, γ with the co-ordinate axes then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$
        A) 1   B) 2   C) 3   D) 0
   iv) Three lines are coplanar if
       A) They are concurrent
       B) A line perpendicular to each other
       C) They are concurrent and a line is perpendicular to each of them
       D) None of these.

   b. Show that the angle between two diagonals of a cube is $\cos^{-1}\frac{1}{3}$ (04 Marks)

   c. Find the equation of the plane which bisects the line joining $(3, 0, 5)$ and $(1, 2, -1)$ at right angles. (06 Marks)

   d. Find the shortest distance between the lines and its equations:
      $\frac{x-8}{3} = \frac{y+9}{16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$. (06 Marks)

8 a. Choose your answers for the following : (04 Marks)
   i) Curl(ϕu) is equal to
      A) ϕ grad u + u grad ϕ 　　　　　　 B) gradϕ.u + ϕdiv u
      C) (grad ϕ)×u + ϕ(curl u) 　　　　　　 D) (ϕ.∇)u + (u.∇)ϕ
   ii) If curl F = 0 then the vector F is said to be
       A) solenoidal   B) Rotational   C) Irrotational   D) Angular velocity
   iii) If $\vec{r} = xi + yj + zk$ then $\nabla \cdot \vec{r}$ is equal to
        A) 3   B) 2   C) 1   D) 0
   iv) If $F = \nabla(x^3 + y^3 + z^3 - 3xyz)$ then curl F is
       A) $6(x + y + z)$ B) $(x + y + z)$ C) 1   D) 0.

   b. Find the directional derivative of $\phi = xy^2 + yz^3$ at $(1, 2, -1)$ in the direction normal to the surface $x \log z - y^2 = -4$ at $(-1, 2, 1)$. (04 Marks)

   c. Find the constants a and b such that
      $\vec{F} = (axy + z^3)i + (3x^2 - z)j + (bxz^2 - y)k$ is irrotational and find the scalar function such that $F = \nabla\phi$. (06 Marks)

   d. If $A = 2x^2i - 3yzj + xz^2k$ and $\phi = 2z - x^3y$ find $A = \nabla\phi$ and $(A \times \nabla\phi)$ at $(1, -1, 1)$. (06 Marks)

* * * * *

4 of 4

First/Second Semester B.E. Degree Examination, December 2012
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

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

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

PART - A

1   a.   Choose the correct answer :   **(04 Marks)**
     i) Which of the following is not a primary fuel.
       A) Wood   B) Crude petroleum oil   C) Natural gas   D) Kerosene
     ii) The following is used as antiknock agent
       A) Triethyl lead   B) Biethyl lead   C) Tetraethyl lead   D) Lead bromide
     iii) Photo voltaic cell is used to get
       A) Light energy   B) Heat energy   C) Electrical energy   D) None of these
     iv) Specific heat of water is
       A) $2.5 kJ kg^{-1}$ B) $3.0 kJ kg^{-1}$ C) $8 kJ kg^{-1}$ D) $4.2 kJ kg^{-1}/K$
   b.   Define gross and net calorific value of a fuel.   **(04 Marks)**
   c.   What is photo voltaic cell? Explain the working of a photo voltaic cell.   **(06 Marks)**
   d.   Calculate the gross calorific value of a sample of coke from the following data :
     Mass of coke = .006 kg   ;   Water equivalent of calorimeter = 2.5 kg   ;
     Mass of water = 1.3kg   ;   Specific heat of water = $4.187 kJ kg^{-1} k^{-1}$;
     Rise in temperature = 1.5K.   **(06 Marks)**

2   a.   Choose the correct answer :   **(04 Marks)**
     i) The conductance of an electrolytic solution depends on the conduction of
       A) Cation only   B) Anion only
       C) Cation and anion   D) Colour of the solution
     ii) The primary reference electrode is
       A) Calomel electrode   B) Hydrogen electrode
       C) Standar hydrogen electrode   D) Zinc electrode
     iii) Glass electrode is
       A) ion – selective electrode   B) H^+_{ion} selective electrode
       C) Membrane electrode   D) All of these
     iv) The element which is kept at the top of electro chemical series is
       A) A_g B) C_u C) Z_n D) L_i
   b.   Define standard electrode potential and derive Nernst's equation for electrode potential.
                                                       (05 Marks)
   c.   What is a reference electrode? Explain construction and working of calomel electrode.
                                                       (05 Marks)
   d.   Write the half – cell reactions and net – cell reaction for the cell.

$$C_{d_{(s)}} | C_d^{2+} (0.01M) \| C_u^{2+} (0.5M) | C_{u_{(s)}}$$

     The standard reduction potentials of cadmium and copper are – 0.40V and + 0.34 V,
     respectively. Calculate the e.m.f. of the cell.   **(06 Marks)**

3   a.   Choose the correct answer :   **(04 Marks)**
     i) Anode material used in lead – acid battery is
       A) M_g B) PbO_2 C) C_u D) Spongy lead

ii) The products produced in MeOH-O_2 fuel cell
    A) $CO_2 + H_2O$ B) $CO + H_2O$ C) $CO_2 + N_2$ D) None of these

iii) Which of the following is a classical battery
    A) $N_i - C_d$ B) $L_i - M_nO_2$ C) Z_n - air   D) N_i - MH

iv) L_i metal is used in $L_i - M_nO_2$ battery because it is
    A) Light   B) Hard   C) Heavy   D) Non - Corrosive

b. Explain the following battery characteristics :
  i) Cycle life   ii) Shelf life   iii) Energy density.   **(06 Marks)**

c. Explain the construction of Pb – acid battery. Give the reactions during discharge and recharge.   **(06 Marks)**

d. What are fuel cells? Explain the construction and working of $H_2 - O_2$ fuel cell.   **(04 Marks)**

4   a. Choose the correct answer :   **(04 Marks)**
  i) When a metal is corroded
    A) Metal is converted into its compound.   B) Metal compound is converted into metal
    C) Brightness of the metal increases   D) Hardness of the metal decreases.

  ii) Which of the following metal gives sacrificial protection to iron against corrosion
    A) S_n B) C_a C) K   D) Z_n

  iii) Corrosion process involves reaction of metal with
    A) O_2 B) H_2O C) O_2 and H_2O D) None of these

  iv) If nuts and bolts are made up of different match, the corrosion is due to
    A) differential aeration   B) differential metal
    C) caustic embittlement   D) None of these

b. Define corrosion of a metal. Explain electrochemical theory of corrosion taking iron as an example.   **(06 Marks)**

c. Explain the effect of the following factors on the rate of corrosion of a metal :
  i) Temperature   ii) Relative areas of anode and cathode   iii) P^H.   **(06 Marks)**

d. Explain water – line corrosion with an example.   **(04 Marks)**

PART – B

5   a. Choose the correct answer :   **(04 Marks)**
  i) Use of HCHO in electroless plating of C_u is to
    A) Oxidation C_u B) Reduction of copper ions
    C) Conversion of C_u^{++} into C_u D) Both B and C

  ii) Use of levelers in electro plating is to
    A) increase the thickness of coating   B) decrease the thickness of coating
    C) to make the deposit brighter   D) achieve uniform thickness of coating.

  iii) To coat an irregular article uniformly, the bath used is
    A) Acid bath   B) Alkaline bath
    C) Neutral bath   D) of good throwing power

  iv) During electro plating of an article, current density employed is
    A) High   B) Low   C) Optimum   D) None of these

b. What is electroless plating? Mention any two advantages of electroless coating.   **(04 Marks)**

c. Discuss electroless plating of Copper.   **(08 Marks)**

d. Write a note on decomposition potential.   **(04 Marks)**

6   a. Choose the correct answer :   **(04 Marks)**
  i) During titration of HCl against NaOH conductance decreases initially because
    A) HCl is a strong acid   B) NaOH is a strong base
    C) Highly mobile H+ ions are replaced by less mobile Na+ ions
    D) Reaction takes place slowly.

ii) During estimation of FAS potentio metrically the indicator electrode used is
 A) Platinum electrode   B) Calomel electrode
 C) Glass electrode   D) Ag/AgCℓ electrode.

iii) In Colorimetric determination of copper the colouring agent used is
 A) $NH_4\,C\ell$ B) NH_4NO_3 C) $(NH_4)_2\,O_4$ D) $NH_4\,OH$

iv) Colorimetry involves measurement of absorbance using monochromatic light in the
 A) Visible range B) I R range   C) UV range   D) Small range

b. Distinguish between thermotropic and lyotropic liquid crystals, with examples.   **(06 Marks)**

c. Define specific conductance and explain the estimation of hydrochloric acid in an given solution conducto metrically using standard solution of Na OH.   **(06 Marks)**

d. What are instrumental methods of analysis? Indicate the advantages over conventional methods.   **(04 Marks)**

7 a. Choose the correct answer :   **(04 Marks)**
 i) An example for natural polymer is
 A) Resin   B) Plastic   C) Polyester   D) Silk

 ii) Bakelite is
 A) Thermoplastic   B) Thermosetting plastic
 C) Homo polymer   D) Addition polymer

 iii) Nylon is made up of
 A) Adipic acid   B) Hexamethylene diamine
 C) Both A and B   D) Phenol formaldehyde

 iv) Teflon is
 A) Hydro carbon polymer   B) Fluro carbon polymer
 C) Hetero polymer   D) Thermo setting polymer

b. Explain free radical mechanism of addition polymerization taking ethylene as an example.   **(06 Marks)**

c. Explain synthesis and uses of i) Teflon   ii) Butyl rubber.   **(06 Marks)**

d. Write a note on thermoplastics and thermosetting plastics.   **(04 Marks)**

8 a. Choose the correct answer :   **(04 Marks)**
 i) Temporary hardness in water is caused by
 A) $Ca(HCO_3)_2$ B) $CaC\ell_2$ C) $CaSO_4$ D) $MgC\ell_2$

 ii) During the preparation of FAS solution in COD experiment dilute H_2SO_4 is added to FAS. Crystals to
 A) make the solution acidic   B) speed up the process of dissolution
 C) prevent hydrolysis   D)   Both A & C

 iii) During the determination of total hardness of water by EDTA NH3 – NH4 Cℓ buffer is used to
 A) Increase PH   B) To decrease PH
 C) To maintain PH at 10   D) None of these

 iv) In reverse osmosis, a semi permeable membrane is used to remove
 A) Suspended impurities   B) Colloidal impurities
 C) Bacteria   D) Dissolved salts

b. Explain the determination of total hardness of water by EDTA method.   **(06 Marks)**

c. In a COD experiment 28.1 mℓ and 14.0 mℓ of 0.05 M FAS solution were required for blank and sample titration respectively. The volume of test sample used was 25mℓ. Calculate the COD of the sample.   **(04 Marks)**

d. How is sulphate in water determined gravimetrically?   **(06 Marks)**

*****

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

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 : Planck's constant, h = 6.63 × 10⁻³⁴ J-S,*
   Velocity of light, c = 3 × 10⁸ m/s,
   Permittivity of vacuum, ∈₀ = 8.85 × 10⁻¹² F/m
   Electron mass, m = 9.11 × 10⁻³¹ kg,
   Electron charge, e = 1.6 × 10⁻¹⁹ C
   Avogadro's number, N_A = 6.025 × 10²⁶/Kmole
   Boltzmann constant, k = 1.38 × 10⁻²³ J/K,

PART – A

1   a.   Choose the correct answers for the following :
      i)   Wien's distribution law explains black body radiation spectrum only for
            A) entire spectrum   B) Longer wave length
            C) shorter wave length   D) none of these
      ii)   de Broglie wave length of an electron accelerated by a potential of 100 V is
            A) 0.01226 nm   B) 0.1226 nm   C) 1.226 nm   D) 12.26 nm
      iii) Phase velocity of the matter wave is
            A) $= V_{particle}$ B) $< V_{particle}$ C) $> V_{particle}$ D) $= 3\ V_{particle}$
      iv)   The momentum of a free particle carrying energy E and mass m is
            A) 2 mE   B) $\sqrt{2mE}$ C) $2\sqrt{mE}$ D) m^2E^2 **(04 Marks)**

   b.   Explain Planck's distribution law.   **(04 Marks)**
   c.   Explain phase velocity and group velocity. Derive the relation between them.   **(08 Marks)**
   d.   A neutron has wave length of 0.166 nm. Find the free energy and velocity of the de Broglie
        wave. Mass of neutron is $m_n = 1.678 × 10^{-27}$ kg.   **(04 Marks)**

2   a.   Choose the correct answers for the following :
      i)   The first permitted eigen energy is called
            A) first level energy   B) zero point energy
            C) maximum energy   D) none of these
      ii)   The amplitude of the eigen function of particle trapped in infinite potential well of
            width 'a' is given by
            A) $\dfrac{\sqrt{2}}{\sqrt{a}}$ B) $\dfrac{\sqrt{2}}{\sqrt{7}}$ C) $\dfrac{\sqrt{a}}{\sqrt{2}}$ D) $\dfrac{2}{a}$
      iii) The product of uncertainty between position and momentum is
            A) $\geq \dfrac{h}{6\pi}$ B) $\leq \dfrac{h}{2\pi}$ C) $\geq \dfrac{h}{4\pi}$ D) $\leq \dfrac{h}{6\pi}$
      iv)   The diameter of the nucleus is of the order
            A) 10^{-4} m   B) 10^{-15} m   C) 10^{-25} m   D) 10^{-45} m
                                                                             (04 Marks)

2   b.   Show that the electrons cannot exist in the nucleus of an atom.   (05 Marks)

      c.   Set up the time independent Schrodinger's wave equation.   (06 Marks)

      d.   An electron is bound in one dimensional box of width 0.16 nm. Find the energy values in the ground state and first two excited states.   (05 Marks)

3   a.   Choose the correct answers for the following :

         i)   Specific heat of 1 mole of electron gas under constant volume is

            A) $\frac{3}{5}R$ B) $\frac{R}{2}$ C) 3R   D) $\frac{3}{2}R$

        ii)   Fermi energy of a metal at $0^{\circ}K$ depends on

            A) kinetic energy of electron   B) potential energy of electron

            C) constant   D) number of free electrons/unit volume

        iii)   Resistivity of a metal with temperature varies as

            A) T^3 B) T^2 C) T^5 D) T

        iv)   Ideal resistivity does not depend upon

            A) temperature   B) inter atomic spacing

            C) impurity   D) lattice defect   (04 Marks)

      b.   Elucidate the difference between classical free electron theory and quantum free electron theory.   (06 Marks)

      c.   Define density of states. Derive the expression for density of states.   (10 Marks)

4   a.   Choose the correct answers for the following :

         i)   The unit of dipole moment/unit volume is

            A) coulomb/metre   B) coulomb/metre^2

            C) coulomb/metre^3 D) coulomb

        ii)   Monoatomic gas atom is placed in a uniform electric field $\vec{E}$, then the resulting induced dipolemoment is proportional to

            A) E   B) E^2 C) E^3 D) independent of E

        iii)   In a dielectric, the orientation polarization is exhibited by

            A) polar dielectric   B) non polar dielectric

            C) mixture of both   D) none of these

        iv)   Piezo electric effect is the production of electricity by

            A) chemical effect   B) varying field   C) temperature   D) pressure

                                                   (04 Marks)

      b.   Explain the properties of ferromagnetic materials.   (04 Marks)

      c.   Derive the expression for internal field in liquids and solids for one dimensional atomic array.   (08 Marks)

      d.   What is the polarization produced in NaCl by an electric field of 500 V/mm if it has dielectric constant of 5.7?   (04 Marks)

PART – B

5   a.   Choose the correct answers for the following :

         i)   The transition of an atom between two energy levels in which two coherent photons are emitted is called

            A) induced absorption   B) spontaneous emission

            C) stimulated emission   D) population inversion

5 a. ii) The distribution of number of atoms in different discrete energy states is governed by
        A) Fermi-Dirac distribution   B) Maxwall-Boltzmann distribution
        C) Bose-Einstein distribution   D) None of these
    iii) Brewster's window's are used in He-Ne laser to obtain
        A) coherent light   B) monochromatic light
        C) powerful light   D) polarized light
    iv) The wave length of light from a semiconductor laser is proportional to

        A) E_g B) $(E_g)^2$ C) $\dfrac{1}{E_g}$ D) $\dfrac{1}{(E_g)^2}$

                                                                            (04 Marks)
  b. Deduce the expression for energy density using Einstein's coefficients and show that
      probability of induced absorption is equal to probability of stimulated emission. **(08 Marks)**
  c. With a neat diagram, explain the construction and working of He-Ne laser. **(08 Marks)**

6 a. Choose the correct answers for the following :
    i) Below transition temperature superconductors behave like perfect.
        A) diamagnets   B) paramagnets   C) ferromagnets   D) ferrimagnets
    ii) SQUIDS are devices that can detect very small changes in
        A) electric fields   B) magnetic fields
        C) gravitational fields   D) radio activity
    iii) Number of modes transmitted by an optical fibre is proportional to
        A) λ B) λ^2 C) $1/\lambda$ D) $1/\lambda^2$
    iv) One of the reasons of attenuation in optical fibers is
        A) refraction   B) reflection   C) absorption   D) interference
                                                                            (04 Marks)
  b. Explain briefly the BCS theory of superconductivity. **(06 Marks)**
  c. Describe the different types of optical fibres with ray propagation and refractive index
      profile diagrams. **(06 Marks)**
  d. An optical fiber has attenuation of 1.5 dB/km. What is the output power if the input power is
      10 mW and the fibre is 3000 m long? **(04 Marks)**

7 a. Choose the correct answers for the following :
    i) A plane has intercepts at a, $\dfrac{b}{2}$, 3c in a unit cell. The miller induces of the plane are

        A) (1 3 2)   B) (2 6 1)   C) (3 6 1)   D) (1 2 3)
    ii) The number of lattice points in a primitive cell are
        A) 1   B) 1/2   C) 2   D) 3/2
    iii) The coordination number in the case of simple cubic crystal structure is
        A) 12   B) 6   C) 2   D) 1
    iv) The number of molecules present in the unit cell of sodium chloride is
        A) 5   B) 2   C) 4   D) None of these
                                                                            (04 Marks)
  b. Define: i) packing factor and ii) coordination number. Calculate the packing factor and
      coordination number for SC, BCC and FCC structures. **(12 Marks)**
  c. Find the miller indices of a set of parallel planes which make intercepts in the ratio 3a:4b on
      x and y axes and, are parallel to z axis, a, b, c being primitive vectors of the lattice. **(04 Marks)**

8 a. Choose the correct answers for the following :

  i)   Under scaling, self inductance of coil is proportional to
       A) L^2 B) L
       C) L^3 D) Independent of scaling

  ii) Under scaling current density is proportional to
       A) L^2 B) L
       C) L^{-1} D) Independent of scaling

  iii) According to electromagnetic scaling laws current is proportional to
       A) L^2 B) L^3 C) L   D) L^{-1}

  iv) Nano-materials are theromodynamically in
       A) stable state   B) unstable state
       C) meta stable state   D) none of these   **(04 Marks)**

    b. Write a note on carbon nano tube and mention their application.   **(04 Marks)**

    c. What is acoustic grating? With a neat diagram, explain the determination of velocity of ultrasonic waves using acoustic grating.   **(08 Marks)**

    d. Give the electromagnetic scaling laws for both steady state and time dependent system.
        (04 Marks)

* * * * *

First/Second Semester B.E. Degree Examination, December 2012
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 your answers for the following :   (04 Marks)
   i)   The part of civil engineering which deals with water supply is called as
         A) Sanitary Engineering   B) Structural Engineering
         C) Geotechnical Engineering   D) Water supply engineering
   ii)   The structure that separates roads into separate lanes is called
         A) Kerb   B) Median   C) Road margin   D) Camber
   iii) The upstream side of a dam
         A) Arch dams   B) Gravity dams   C) Earth dams   D) Reservoir
   iv)   Bridges are supported on
         A) Roadway   B) Piers and Abutments
         C) Wing wall   D) Arches
   b. What are the infrastructure related projects?   (04 Marks)
   c. Explain how a country would prosper by infrastructural developments.   (06 Marks)
   d. Mention the advantages and disadvantages of "Bow-string girder bridges".   (06 Marks)

2 a. Choose your answers for the following :   (04 Marks)
   i)   The force system which has same line of action and lie in same plane is known as
         A) Coplanar collinear   B) Non-coplanar concurrent
         C) Non-coplanar non concurrent   D) Coplanar concurrent
   ii)   A body that does not deform when subjected to external force is called
         A) Flexible body   B) Elastic body   C) Rigid body   D) Plastic body
   iii) The force is characterized by
         A) its magnitude   B) its direction C) its line of action D) All the above
   iv)   A couple consists of
         A) Two like parallel forces of same magnitude
         B) Two like parallel forces of different magnitude
         C) Two unlike parallel forces of same magnitude
         D) Two unlike parallel forces of different magnitude.
   b. State and explain principle of transmissibility.   (04 Marks)
   c. Define continuum, rigid body, point fine and particle.   (04 Marks)
   d. Determine the tension in each chain if a weight of 1000N is supported by two chains as
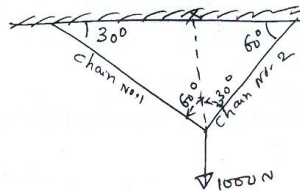   shown in Fig.Q.2(d).   (08 Marks)

Fig.Q.2(d)

3   a.   Choose your answers for the following :
     i)   Number of forces acting simultaneously on a body   (04 Marks)
           A) May be replaced by a single force   B) may not be replaced by a single force
           C) may be replaced by a couple   D) None of the above
     ii)   When two forces is of magnitude P act at right angles to each other, the resultant will
           be

           A) P   B) P $(2)^{1/2}$ C) $\dfrac{P}{(2)^{1/2}}$ D) 2P

     iii) Coplanar forces means
           A) forces in different planes   B) forces in a plane
           C) forces are zero   D) forces are non concurrent
     iv)   Collinear forces means
           A) forces are parallel to each other   B) forces are imaginary
           C) forces are in same line   D) None of the above
    b.   Determine the resultant of three forces acting on a hook shown in Fig.Q.3(b).   (06 Marks)
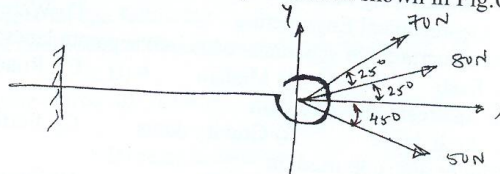
Fig.Q.3(b)

    c.   A dam is subjected to the forces as shown in Fig.Q.3(c). Determine the resultant and locate
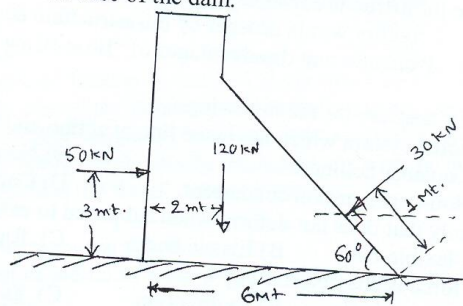   its point of application with base of the dam.   (10 Marks)

Fig.Q.3(c)

4   a.   Choose your answers for the following :
     i)   Point where the entire mass of a body may be assumed to be concentrated is known as   (04 Marks)
           A) Moment of inertia   B) Centre of gravity
           C) Radius of gyration   D) None of the above
     ii)   For practical purposes, centre of gravity and centre of mass are assumed to be
           A) Different   B) Zero   C) Absolute   D) Same
     iii) For a triangle, centroid is the point of intersection of
           A) Sides   B) Base line   C) Vertex   D) Medians
     iv)   All axes of symmetry are
           A) Centroidal axes   B) Perpendicular axes
           C) Inclines axes   D) None of the above
    b.   Determine the centre of gravity of a semicircle by the method of integration.   (06 Marks)

2 of 4

c. Locate the center of gravity of the lamina shown in Fig.Q.4(c).   **(10 Marks)**

Fig.Q.4(c)
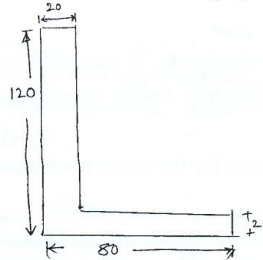
PART – B

5 a. Choose your answers for the following :   **(04 Marks)**
   i)   A resultant can replace _____ forces in a system in effect
        A) Some   B) NIL
        C) All   D) None of the above
   ii) A diagram showing isolated body indicating all the forces is known as
        A) Free body diagram   B) Space diagram
        C) Vector diagram   D) None of the above
   iii) The force equal and opposite to resultant is called as
        A) Resultant force   B) Equilibrant
        C) Similar force   D) None of the above
   iv) If three forces act on a particle, in equilibrium, then each force is proportional to _____
        of the angle included between other two forces
        A) cos   B) tan   C) sine   D) cot

   b. Mention the conditions of static equilibrium for different force systems.   **(04 Marks)**
   c. A body weighing 2000N is suspended by a chain AB-2 mt long. If its pulled by horizontal
      force of 320N, determine the force in the chain and determine whether point B is in
      equilibrium under the action of three forces. Refer Fig.Q.5(c).   **(12 Marks)**

Fig.Q.5(c)
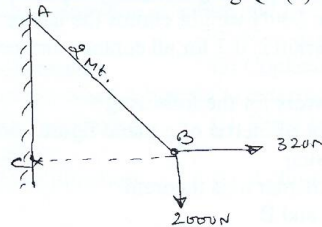
6 a. Choose your answers for the following :   **(04 Marks)**
   i)   The number of reactions components in a hinged end of a beam are
        A) 2   B) 3   C) 1   D) None of the above
   ii) UDL stands for
        A) uniform dead load   B) uniform door load
        C) uniform diameter load   D) uniformly distributed load
   iii) A determinate beam can have maximum unknowns
        A) 2   B) 3   C) 1   D) 4
   iv) A cantilever beam is one in which _____
        A) One end is fixed and other free
        B) One end is fixed and other simply supported
        C) Both ends roller supported
        D) None of the above.

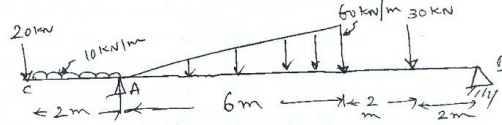b. Determine the support reactions for the beam shown in Fig.Q.6(b). **(08 Marks)**

Fig.Q.6(b)

c. Determine the reactions for the beam loaded as shown in Fig.Q.7(c). **(08 Marks)**
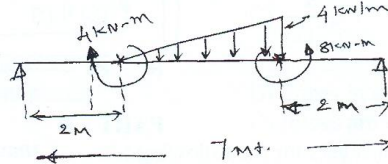

Fig.Q.6(c)

7 a. Choose your answers for the following : **(04 Marks)**
   i) The value of coefficient of friction should not be more than
      A) 2   B) 4   C) 1   D) 0.25
   ii) The maximum force of friction _____ as the normal force between the bodies increases.
      A) decreases   B) remain constant   C) increases   D) multiplies
   iii) Friction force is a _____
      A) tangential force   B) Axial force   C) normal force   D) collinear force
   iv) Friction is _____ to the contact surface between bodies
      A) Parallel   B) Perpendicular
      C) tangential   D) None of the above

   b. Prove that the angle of friction is equal to angle made by an inclined plane with horizontal when a solid body, placed on inclined plane is about to slide down. **(06 Marks)**

   c. A ladder 5m long, 250N weight is placed against a vertical wall inclined at 30^0 to the vertical. A man of 800N weight climbs the ladder. At what position will he induce slipping? Coefficient of friction is 0.2 for all contact surfaces. **(10 Marks)**

8 a. Choose your answers for the following : **(04 Marks)**
   i) The moment of inertia of a plane figure about an axis parallel to reference axis can be found by using
      A) Perpendicular axis theorem   B) Parallel axis theorem
      C) Both A and B   D) None of the above
   ii) Radius of gyration of a plane lamina about x-x axis is
      A) sqrt (Ixx/A)   B) Ixx/A
      C) $Ixx/\sqrt{A}$ D) Ixx/A^2
   iii) Moment of inertia of a square of side 'b' about an axis through its centroid is _____
      A) $b^4/12$ B) $b^4/8$ C) $b^4/36$ D) $b^3/12$
   iv) Unit of second moment of area is
      A) m   B) m^2 C) m^4 D) m^5

   b. Determine the moment of inertia of a circular section about an axis passing through center and perpendicular to the plane of the paper. **(08 Marks)**

   c. Determine the second moment of area of a 'T' section about horizontal centroidal axis if flange is 100mm × 20mm, total depth of section is 100mm. Web is 20mm thick **(08 Marks)**

* * * * *

First/Second Semester B.E. Degree Examination, December 2012
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Choose the correct answers for the following :

      i)   Ocean tides containing a large amount of _____ energy
         A) Kinetic Energy   B) Potential Energy
         C) Potential and Kinetic Energy   D) None of these

      ii) Nuclear energy is obtained by _____ reaction in nuclear reactor
         A) Fission   B) Fusion
         C) Fission and Fusion   D) None of these

      iii) The function of the fusible plug in the boiler is to _____
         A) increase flue gas temp   B) Increase life of boiler
         C) Extinguish the fire in furnace   D) drain off the condensed steam

      iv) An example for fire tube boiler is _____
         A) Cochran Boiler   B) Lancashire Boiler
         C) Both A and B   D) None of these.   **(04 Marks)**

  b. Define renewable and non renewable energy sources and give examples.   **(06 Marks)**

  c. With a neat sketch, explain the working of Babcock and Wilcox boiler.   **(10 Marks)**

2 a. Choose the correct answers for the following :

      i)   Method of reducing _____ of working fluid is know as compounding
         A) Velocity   B) Pressure and Temperature
         C) Speed and pressure   D) None

      ii) In a reaction turbine _____ drops when the fluid passes over blades
         A) Velocity   B) Pressure
         C) Temperature   D) None

      iii) Pelton wheel _____ flow turbine
         A) Radial   B) Axial
         C) Tangential   D) None

      iv) In a open cycle gas turbine _____ transfer takes place in addition to heat and work transfer between system and surrounding.
         A) Mass Transfer   B) Work Transfer
         C) Heat Transfer   D) None.   **(04 Marks)**

  b. Sketch and explain the working of Pelton wheel.   **(10 Marks)**
  c. Sketch and explain a closed cycle gas turbine.   **(06 Marks)**

3   a. Choose the correct answers for the following :

     i)   In petrol engine heat is supplied at constant _____

        A) Temperature   B) Volume
        C) Pressure   D) Enthalpy

     ii) Carburettor is used in _____ engine

        A) Diesel   B) Petrol
        C) Crude oil   D) None of these

     iii) The link that connects the Piston and Crank shaft by means of pin joints is called as __

        A) Cylinder   B) Cam Shaft
        C) Connecting Rod   D) None

     iv) Number of strokes required to complete 1 cycle in 4 stroke engine is _____

        A) 8   B) 2
        C) 1   D) 4.   (04 Marks)

   b. With the help of a p-v diagram, explain the working of 4 stroke diesel engine.   (10 Marks)

   c. The following data were recorded on a 4-stroke engine. Bore = 25 cm, stroke = 40 cm, crank speed = 250 rpm. Net load on brake drum = 700 N. Diameter of brake drum = 2 m, indicated mep = 6 bar. Fuel consumption = 0.0013 kg/sec. Sp gr of fuel = 0.78, CV. of fuel = 43900 kJ/kg. Find i) BP ii) IP iii) FP.   (06 Marks)

4   a. Choose the correct answers for the following :

     i)   The boiling point temperature of Freon – 12 is _____

        A) – 20.8° C   B) – 29.8° C
        C) – 40.8° C   D) – 33.3° C

     ii) A good refrigerant should have _____

        A) Low Specific Heat   B) Low Viscosity
        C) Low Freezing Point   D) All

     iii) Commonly used refrigerant in vapour absorption refrigeration system is _____

        A) Freon – 22   B) Freon - 12
        C) Ammonia   D) CO_2

     iv) The performance of a refrigerator is measured by a factor known as _____

        A) Ton of refrigeration   B) COP
        C) Litres   D) None.   (04 Marks)

   b. What are the desirable properties of refrigerant? List four commonly used refrigerants.
                                                        (06 Marks)

   c. Explain with a neat sketch the working of vapour compression refrigeration.   (10 Marks)

PART – B

5 a.   Choose the correct answers for the following :

  i)   An operation of enlarging an existing hole is _____
        A) Counter Boring   B) Counter Sinking
        C) Boring   D) Tapping

  ii)   Taper angle of rod at which compound rest to be swiveled is _____

        A) $\tan\alpha = \dfrac{D-d}{L}$ B) $\tan\alpha = \dfrac{D-d}{2L}$

        C) $\tan\alpha = \dfrac{2(D-d)}{L}$ D) None

  iii) The operation of cutting internal threads in a drilled hole is called _____

        A) Boring   B) Counter sinking
        C) Reaming   D) Tapping

  iv)   Shank is the portion of _____
        A) Lathe tool   B) Thread Cutting Tool
        C) Drill bit   D) None of these.   **(04 Marks)**

  b.   With neat sketches, explain the lathe operations :
       i) Facing   ii) Cylindrical Turning.   **(06 Marks)**
  c.   Draw a neat sketch of radial drilling machine and explain its working.   **(10 Marks)**

6 a.   Choose the correct answers for the following :

  i)   Up and down moving part of milling machine is _____
        A) Saddle   B) Arbor
        C) Spindle   D) Knee

  ii)   The process used to machine contours consists of curves is _____
        A) Angular Milling   B) Sow Milling
        C) Form Milling   D) End Milling

  iii) _____ is a substance that is used for grinding as polishing operation
        A) Abrassive   B) Bonds
        C) Adhesives   D) None

  iv)   In _____ process the work piece is fed in opposite direction as that of cutter direction
        A) Horizontal Milling   B) Vertical Milling
        C) Down Milling   D) Up Milling.   **(04 Marks)**

  b.   Draw a schematic sketch of a horizontal milling machine and label its part.   **(10 Marks)**
  c.   Explain with a neat sketch, the principle of operation of surface grinding.   **(06 Marks)**

7   a.   Choose the correct answers for the following :

   i)   In pressure welding the parts to be joined are heated to _____ state

      A) Liquid State   B) Boiling State
      C) Plastic State   D) none of these

   ii)   The joining process which uses special fusible alloy to join 2 similar or dissimilar
        parts is _____

      A) Soldering   B) Brazing
      C) Welding   D) All

   iii)   An example for solid lubricants is _____

      A) Synthetic Oil   B) Grease
      C) Tale   D) None

   iv)   _____ is a property of a good lubricant

      A) Porosity   B) Electricity
      C) Viscosity   D) None.   (04 Marks)

   b.   Sketch and explain electric are welding process.   (08 Marks)
   c.   What is the necessity of lubrication? List the types of lubricants used.   (04 Marks)
   d.   With a neat sketch explain the ball bearing.   (04 Marks)

8   a.   Choose the correct answers for the following :

   i)   The gear used for intersecting axes shafts is _____ gear

      A) Spur   B) Helical
      C) Spiral   D) Bevel

   ii)   The ratio of pitch diameter to the number of teeth is called _____

      A) Module   B) Dedendum
      C) Adendum   D) None

   iii)   Due to slip of the belt, the velocity ratio of the belt drive _____

      A) Decreases   B) Increases
      C) Remains Same   D) None of these

   iv)   The length of open belt pulley of diameters d_1 and d_2 kept at a distance 'x' apart is
        _____

      A) $\frac{\pi}{2}(d_1 + d_2) + 2x + \frac{(d_1 + d_2)^2}{4r}$ B) $\frac{\pi}{2}(d_1 - d_2) + 2x + \frac{(d_1 - d_2)^2}{4r}$

      C) $\frac{\pi}{2}(d_1 + d_2) + 2x + \frac{(d_1 - d_2)^2}{4r}$ D) $\frac{\pi}{2}(d_1 - d_2) + 2x + \frac{(d_1 + d_2)^2}{4r}$.

                                                                                    (04 Marks)

   b.   A compound gear train consists of 4 gears P, Q, R and S having 20, 40, 60 and 80 teeth
        respectively. The gear P is keyed to driving shaft, Gear S to driven shaft. Q and R are
        compound gears, Q meeting with P and R meshes S. If P rotates at 150 rpm, what is the rpm
        of gear S.   (08 Marks)
   c.   Distinguish between : i) Open and cross belt drive
                             ii) Simple and compound gear train.   (08 Marks)

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

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)   For a given circuit of 10kΩ, a potential difference of 100V is applied. If the voltage is trebled and circuit resistance is increased by four times, the value of current is
            A) 10A   B) 7.5 mA   C) 0 A   D) 7.5A
         ii)   The unit of magneto motive force (MMF) is
            A) Ampere   B) No. of turns   C) Volf - ampere   D) Ampere turns
         iii)   The unit of statically induced emf is volts, then the unit of dynamically induced emf is
            A) Watts   B) Webers   C) Volts   D) Volt - ampere
         iv)   Two resistances 4.4Ω, 10.5Ω are connected in parallel, the circuit is energized by 100V supply. The current flowing through 10.5Ω resistor is
            A) 20A   B) 9.25A   C) 2.5A   D) 8.92mA

    b.   In a Series – Parallel circuit shown in fig. Q1(b), find
       i)   The voltage drop across 4Ω ii)   Supply voltage.   **(08 Marks)**

            Fig.Q1(b)
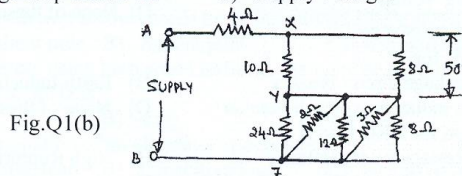
    c.   Define the coefficient of coupling. Derive the equation for the same. Explain its effect on magnetic circuit.   **(08 Marks)**

2   a.   Choose the correct answer :   **(04 Marks)**
         i)   Which of the following devices work at unity power factor
            A) Induction motor   B) Electric Iron   C) Fluorescent lamp   D) Condenser bank
         ii)   The equation of an alternating current is given by i = 42.42 Sin 314t. The form factor is
            A) 1.414   B) 3.1414   C) 1.111   D) 4.44
         iii)   Two impedances $Z_1 = (150 + j\ 157)\Omega$, $Z_2 = (100 - j\ 110)\Omega$ are connected in parallel across 220V , 50Hz supply. The power factor of circuit is
            A) 0.978 lead   B) 0.707 lag   C) 0.707 lead   D) 0.637 lead
         iv)   Power factor of AC circuit can be improved by connecting
            A) Choke   B) Synchronous motor
            C) Induction motor   D) Fluorescent lamp

    b.   Obtain the expression for instantaneous voltage, current, power, power factor in case of series R-L-C circuit by considering all three cases $X_L > X_C$, $X_L < X_C$, $X_L = X_C$. Draw neat phasor diagrams in all 3 cases.   **(10 Marks)**

    c.   When a voltage represented by e = 100 sin (314t + 20^0) volts is applied to a series R-L circuit, the power absorbed is 800 watts and power factor is 0.7. Find R & L and write down the expression for current.   **(06 Marks)**

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

   i) In a star connected system, the relationship between line current and phase current is

     A) $I_L = \sqrt{2}\ I_{ph}$ B) $I_L = I_{ph}$ C) $IL = 0.707\ I_{ph}$ D) $IL = \sqrt{I_{ph}}$

   ii) Two wattmeters connected in a balanced system indicates 4.5kW, -0.5kW. What is the power factor of circuit?

     A) 0.4193   B) 0.707   C) Unity   D) 0.963

   iii) A balanced star connected load of $(8 + j6)\ \Omega$ per phase is connected to a 3 phase 440V supply. The line current is

     A) 254.03A   B) 25.403A   C) 103.3A   D) 33.33A

   iv) The total reactive power consumed by 3 phase load is given by

     A) $Q = \sqrt{2} \times |V| \times |I|$ B) $Q = \sqrt{2} \times |V| \times |I| \cos\phi$

     C) $Q = \sqrt{3} \times |V|\ |I|\ \sin\phi$ D) $Q = \sqrt{3} \times |V| \times |I|\ \cos\phi$

b. Derive an expression for the power factor of a 3 phase balanced load in terms of two wattmeter readings. Also, draw the phasor diagram. (08 Marks)

c. Two wattmeters, W_1 & W_2 are used for measurement of power in a balanced 3 phase circuit. What is the power factor when i) $P_1 = 2P2$ ii) $P_2 = -P2$? (04 Marks)

d. List the advantages of 3 phase system over single phase system. (04 Marks)

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

   i) Fusing factor is defined as the ratio of

     A) $\dfrac{\text{Fusing current}}{\text{Rated current}}$ B) $\dfrac{\text{Fusing current}}{\text{Fusing voltage}}$

     C) $\dfrac{\text{Fusing voltage}}{\text{Fusing resistance}}$ D) None of these

   ii) ELCB stands for

     A) Earth leakage circuit breaker   B) Earth Inductance circuit breaker

     C) Voltage inductance circuit breaker   D) None of these

   iii) The acronym for HRC fuse is

     A) High Resistance capacitance   B) High Rupturing capacity

     C) High rupturing capacitive   D) H – resistance – C

   iv) Energy meter is used to measure

     A) Current   B) Voltage   C) Power   D) Energy

b. Explain the construction and working of a 1 ϕ induction type Energy meter. (08 Marks)

c. What is Earthing? Why is it necessary? (04 Marks)

d. Draw the neat sketch of pipe earthing and label parts. (04 Marks)

PART - B

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

   i) A lap connected d-c machine has 8 pole, 960 armature conduction, flux pole is 62 mwb, driver at a speed of 1000 rpm, Emf generated is

     A) 992 volts   B) 1992 volts   C) 2992 volts   D) 192 volts

   ii) The e.m.f generated in DC generator is of type

     A) Statically induced emf   B) Dynamically induced emf

     C) Induced emf   D) None of these

   iii) The starting current of DC motor can be controlled to safe value by using

     A) Wattmeter   B) Starters   C) Fuse   D) Multimeter

   iv) For charging of batteries, the type of generator used is

     A) Shunt generator   B) Series generator

     C) Differently compound generator   D) None of these

b. Derive an e.m.f equation of DC generator. List the factors on which e.m.f of d.c generator depends. **(06 Marks)**

c. A 250V d.c. shunt motor on no load runs at 1000 rpm and takes 5A. The total armature circuit and shunt field resistance are 0.2Ω, 250Ω respectively. Calculate the speed when loaded and taking a current of 50A, if armature reaction weakens the field by 3%. Assume the contact drop of 1V at each brush. **(10 Marks)**

6 a. Choose the correct answer : **(04 Marks)**
   i) The eddy current loss in a transformer is minimized by using
       A) Solid core   B) Laminated core   C) Plastic core   D) None of these
   ii) The copper loss in a transformer is
       A) Variable loss   B) Fixed loss   C) Stray loss   D) Steady loss
   iii) Efficiency of a transformer is maximum only when
       A) Cu loss = $\sqrt{\text{coreloss}}$ B) Coreloss = $\sqrt{\text{Cu loss}}$
       C) Cu loss = core loss   D) None of these
   iv) The rating of transformer is measured in
       A) kW   B) kVA   C) KVAR   D) $\sqrt{\text{KVA}}$

   b. With usual rotations, derive the EMF equation of a transformer. Write turns ratio and voltage ratio equations. **(06 Marks)**

   c. Find the efficiency of 150 KVA 1ϕ transformer at :
      i) Full load   ii) 50% of full load, if the Cu loss at full load is 1600W and iron loss is 1400W.
      iii) Why the efficiency of practical transformer is typically greater than 96%. **(10 Marks)**

7 a. Choose the correct answer : **(04 Marks)**
   i) Alternators driven at low speeds by prime movers like water turbine will have rotor of type
       A) Non salient pole   B) Salient pole   C) Cylindrical   D) None of these
   ii) For alternators using high speed turbines, the number of rotor poles required to generate electricity at 50Hz is
       A) 2   B) 4   C) 6   D) 50
   iii) Voltage regulation of an alternator is negative for
       A) Inductive load   B) Capacitive load   C) Resistive load   D) None of these
   iv) The synchronous generator rotates at synchronous speed
       A) $N_s = \dfrac{120f}{P}$ kW   B) $N_s = \dfrac{1200f}{2P}$ C) $N_s = \dfrac{1.20f}{P}$ D) $N_s = \dfrac{\sqrt{3}f}{4P}$

   b. With usual notation, derive the EMF equation of alternator. List the assumptions while arriving the equation. **(08 Marks)**

   c. Define the voltage regulation of alternator? Why the terminal voltage of alternator decreases with load. List the reasons. **(04 Marks)**

   d. A 12 pole, 500 rpm, star connected alternator has 60 slots, with 20 conductors per slot. The flux per pole is 0.02 Wb and is distributed sinusoidally. The winding factor is 0.93. Calculate
      i) Frequency   ii) Phase emf   iii) Line emf. **(04 Marks)**

8 a. Choose the correct answer : **(04 Marks)**
   i) At the time of starting, induction motor draws current about
       A) 6 to 7 times rated FL   B) 2 times rated FL
       C) 20 times FL   D) None of these
   ii) When the I.M. is not located the slip can be approximately
       A) Zero   B) 2   C) 3   D) 4
   iii) When the I.M. is loaded, the rotor tends to retard more so that slip
       A) Increases   B) Remains constant   C) Decreases   D) None of these

iv) A 3 phase, 50 Hz, 6 pole I.M. has a full load percentage slip of 3%. The synchronous speed is

    A) 2000 rpm   B) 1000 rpm   C) 100 rpm   D) 10 rpm

b. Why starters are required for induction motors? With neat sketch, explain the working of Star – Delta starter used with 3 phase I.M. **(08 Marks)**

c. The power input to a 3 phase I.M. is 50kW and corresponding stator losses are 2kW.
    i) Calculate the total mechanical power developed and rotor Cu loss when slip in 3%
    ii) The output horse power of the motor if the friction and windage loss are 1kW
    iii) Efficiency of the motor. **(08 Marks)**

*****

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

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   Choose the correct answers for the following :   **(04 Marks)**
       i)   The Depletion layer in a pn junction contains
            A) Electron   B) Holes
            C) Electrons and holes   D) Ions
       ii)   The turn on voltage of a Si Diode is nearly
            A) 0.7 volts   B) 0.3 volts   C) 1 volt   D) 0.1 volts
       iii)   Once a Zener diode goes into break down the parameter which does not change much is
            A) Current   B) Resistance   C) Voltage   D) Capacitance
       iv)   If f Hz is the frequency of the input given to a fullwave rectifier, the output frequency will be
            A) f Hz   B) 2f Hz   C) 3f Hz   D) 4f Hz

    b.   With a neat diagram, explain the process of formation of depletion layer in a pn junction.   **(04 Marks)**

    c.   The incremental change in the voltage and the current is found to be 0.19V and 37.6 mA respectively from the forward characteristics of the diode. Determine the ac resistance of the junction.   **(04 Marks)**

    d.   A single phase half wave rectifier supplies power to a 1 KΩ load. The inpue voltage is 200 volt rms. Neglecting forward resistance of the diode, calculate:
      i) V_{dc} ;   ii) V_{rms} ;   iii) I_{dc} ;   iv) Ripple voltage (rms calue).   **(08 Marks)**

2   a.   Choose the correct answers for the following: **(04 Marks)**
       i)   The current amplification factor α_{dc} of a transistor is given by
            A) I_C/I_E B) I_C/I_B C) I_E/I_B D) I_B/I_E
       ii)   In the following relationships between α and β, one of the expression is wrong
            A) $\beta = \dfrac{\alpha}{1-\alpha}$ B) $\alpha = \dfrac{\beta}{1-\beta}$ C) $\alpha = \dfrac{\beta}{1+\beta}$ D) $1-\alpha = \dfrac{1}{1+\beta}$
       iii)   For a transistor to function as a normal amplifier
            A) EB junction is reverse biased and CB junction is forward biased.
            B) EB junction is forward biased and CB junction is forward biased.
            C) CB junction is reverse biased and EB junction is reverse biased.
            D) CB junction is reverse biased and EB junction is forward biased.
       iv) β_{dc} of a transistor is
            A) Equal to α_{dc} B) Less than α_{dc}
            C) Greater then α_{dc} D) None of the above

b. Draw the symbols of a pnp and an npn transistors. Which of the transistor current is always the largest? Which is always the smallest? Which two currents are relatively close in magnitude? **(05 Marks)**

c. Explain the working of a transistor amplifier in the CE configuration. Draw its output characteristics and mark the three regions of operation on the characteristics. **(06 Marks)**

d. Determine β_{dc}, I_E and α_{dc} for a transistor where $I_B = 50\mu A$ and $I_C = 5mA$. Neglect I_{CBO}. **(05 Marks)**

3 a. Choose the correct answers for the following: **(04 Marks)**
   i) The best location of the Q-point for a transistor is
      A) At the bottom of the dc load line   B) At the top of dc load line
      C) At the centre of the dc load line   D) Outside the dc load line
   ii) The dc load line of a transistor circuit
      A) has a positive slope
      B) does not contain the Q-point
      C) has a negative slope
      D) gives graphic relationship between I_C and I_B
   iii) The early effect in a bipolar junction transistor is caused by
      A) Fast turn on   B) Fast turn off
      C) Large collector base reverse bias   D) Large emitter base forward bias
   iv) A BJT is said to be in saturation region if
      A) both junctions are reverse biased
      B) EB junction is reverse biased and CB junction is forward biased
      C) EB junction is forward biased and CB junction is reverse biased
      D) both junctions are forward biased

   b. Define bearing of a transistor. Explain with a neat circuit diagram the operation of a collector to base bias circuit. What is the advantage of this circuit over a fixed bias circuit? **(08 Marks)**

   c. Given that $I_{CQ} = 2mA$ and $V_{CEQ} = 10V$. Determine R_1 and R_C for the network shown. $V_{BE} = 0.7V$. **(08 Marks)**
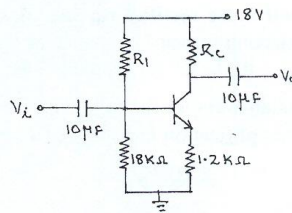

Fig.Q.3(c)

4 a. Choose the correct answers for the following : **(04 Marks)**
   i) The latching current in a SCR
      A) is less than holding current   B) is greater than holding current
      C) is equal to the holding current   D) None of the above
   ii) Which of the device mentioned acts like a diode and two resistors
      A) SCR   B) TRIAC   C) DIAC   D) UJT
   iii) A FET consists of
      A) Source   B) Drain   C) Gate   D) All the above
   iv) Which of the following is a unipolar device
      A) Diode   B) BJT   C) SCR   D) FET

b. Draw the symbol and the equivalent circuit of UJT. Using the equivalent circuit explain the working of UJT and draw its characteristics marking the various regions on it. **(08 Marks)**

c. Explain the working of a SCR using two transistor model and obtain the expression for the anode current. **(08 Marks)**

PART – B

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

    i)   The gain of a cascaded amplifier is
        A) Sum of the voltage gains of all the stages
        B) difference of the voltage gains of all stages
        C) Products of the voltage gains of all stages
        D) None of the above

    ii) The frequency of oscillations in an oscillator is given by

        A) $\dfrac{1}{2\pi LC}$ B) $2\pi LC$ C) $2\pi \sqrt{LC}$ D) $\dfrac{1}{2\pi \sqrt{LC}}$

    iii) An oscillator is
        A) like an alternator   B) an amplifier
        C) an amplifier with positive feedback   D) a rectifier

    iv) For a Colpilt's oscillator $C_1 = 0.01\ \mu F$, $C_2 = 0.001 \mu F$ and $L = 15 \mu H$. Its operating frequency is
        A) 1362 kHz   B) 1500 kHz   C) 100 Hz   D) 2651 kHz

b. Draw and explain a typical frequency response curve of a RC coupled amplifier clearly indicate the various regions in it. **(06 Marks)**

c. List out the advantages of negative feed back. **(04 Marks)**

d. A Hartley oscillator is designed with $L_1 = 20\mu H$ and $L_2 = 2mH$ and a variable capacitor. Determine the range of capacitance values, if the frequency of oscillation is varied between 1 MHz to 2.5 MHz. Neglect mutual inductance. **(06 Marks)**

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

    i)   An Op-Amp
        A) amplifies the sum of the two signals applied across its terminals
        B) amplifies the product of the two signals applied across its terminals
        C) amplifies the difference of the two signals applied across its terminals
        D) None of the above

    ii) An ideal Op-Amp has
        A) infinite A_v B) infinite R_i C) zero R_o D) All the above

    iii) An inverting amplifier has $R_F = 2M\Omega$ and $R_1 = 2K\Omega$. Its scale factor is
        A) 1000   B) -1000   C) 10^{-3} D) -10^{-3}

    iv) CMRR of an Op-Amp is given by

        A) $|A_d||A_c|$ B) $|A_d|+|A_c|$

        C) $\dfrac{|A_d|}{|A_c|}$ D) $|A_d|-|A_c|$

b. Draw the equivalent circuit of an Op-Amp. **(04 Marks)**

c. Draw the circuit of an Op-Amp as a non-inverting summer and device an expression for output voltage. **(06 Marks)**

d. Draw the basic structure of a cathode ray tube and explain its working. **(06 Marks)**

7 a. Choose the correct answers for the following : (04 Marks)
    i) The main purpose of modulation is to
       A) Combine two waves of different frequencies
       B) achieve wave shaping of the carrier wave
       C) transmit low frequency information over long distances efficiently
       D) produce side bands
    ii) In amplitude modulation
       A) Carrier frequency is changed   B) Carrier amplitude is changed
       C) Three side bands are produced   D) Fidelity is improved
    iii) The binary addition of 1+1+1 gives
       A) 111   B) 10   C) 110   D) 11
    iv) The binary equivalent of $(A)_{16}$ is
       A) 1010   B) 1011   C) 1100   D) 1110

  b. What are the basic components of a communication system? Draw and explain the block diagram of a typical communication system. (06 Marks)

  c. If the radiated power of an AM transmitter is 10kW, determine the power in the carrier for a modulation index of 0.6. (04 Marks)

  d. Perform the following subtraction using 2's complement i) 78-65 ; ii) 708-648. (06 Marks)

8 a. Choose the correct answers for the following : (04 Marks)
    i) The output of a 2 input OR gate is zero only when
       A) both inputs are zero   B) either input is one
       C) both inputs are one   D) either input is zero
    ii) A NOR gate is ON only when all its inputs are
       A) ON   B) Positive   C) High   D) Zero
    iii) ABCD + ABD is equal to
       A) ABC   B) $\overline{ABC}$ C) $\overline{ABD}$ D) ABD
    iv) A (A + B) is equal to
       A) B   B) AB   C) $\overline{AB}$ D) A

  b. Determine the output of the logic circuit shown in the figure (04 Marks)
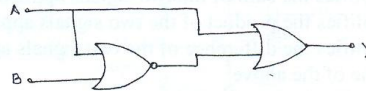

Fig.Q.8(b)

  c. Simplify the following:
    i) $\overline{AB} + \overline{A} + AB$
    ii) AB + A(B + C) + B(B + C) (06 Marks)

  d. Reduce the Boolean expression
    $Y = \overline{A}BC\overline{D} + BC\overline{D} + B\overline{C}D + B\overline{C}D$
    and implement it using logic gates. (06 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐ **Question Paper Version : C**

First/Second Semester B.E Degree Examination, January 2013
Constitution of India and Professional Ethics
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE mark**.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

---

1. The main objective of the directive principles of state policy is to establish
   a) Welfare state in India   b) Federal state   c) Capitalist state   d) Hindu state.

2. A person who has been arrested to be produced before the court/magistrate within
   a) 24 hours excluding journey hours   b) 48 hours
   c) 24 hours including journey hours   d) one month.

3. Which provisions of the constitution provides constitutional remedy to protect the fundamental rights of the citizens in India?
   a) Articles 15 & 16   b) Articles 29 & 30   c) Articles 20 & 21   d) Articles 226 & 32.

4. One of the impediments to discharge the responsibility by engineers is
   a) Ego – centric tendencies   b) Cooking   c) With holding information   d) Ambiguity.

5. Professional Ethics means
   a) Set if rules relating to personal character.   b) Set of moral standards of profession.
   c) Depth knowledge in the field of profession.   d) Set of regulations framed by engineering colleges.

6. A new technology in the field of any profession is intimately connected with
   a) Good work   b) Honesty   c) Risk   d) Penalty.

7. Who appoints the Chief Justice and other Judges of the High court?
   a) Prime Minister   b) Law Minister   c) President   d) Governor

8. How many members are nominated by the President of India to the Rajya Sabha?
   a) 2   b) 12   c) 20   d) 10

9. In which of the House motion of no confidence against the government can only be introduced and passed?
   a) Lok Sabha   b) Rajya Sabha   c) Cabinet   d) None of these

10. The use of intellectual property of others without proper permission is known as
    a) Trimming   b) Dishonesty   c) Plagiarism   d) Forging

11. Who has the Power to Pardon the death punishment of a criminal?
    a) President   b) Prime Minister   c) Attorney General of India   d) Chief Justice of India

12. Who has the power to certify the money bill?
    a) Speaker of Lok Sabha   b) Chairman of Rajya Sabha
    c) President of India   d) Auditor and Comptroller – General of India.

13. How many members are nominated by the President of India to Lok Sabha under a special Provisions of the constitution from Anglo – Indian Community?
    a) 40   b) 20   c) 12   d) 2

14. Which bill can be introduced only in Lok Sabha with prior recommendations of the President of India?
    a) Ordinary bill   b) Bill relating to impeachment of CJI
    c) Money bill   d) Constitution Amendment bill

15. The President of India is elected by "Electoral College" consisting of
    a) Elected members of Lok Sabha, Rajya Sabha and members of legislative assemblies.
    b) Only the members of Parliament (LS & RS).
    c) All the adult people of India.
    d) All the elected members of central legislature and state legislature including MLCs.

16. The country almost loses its federal structure and becomes unitary in form during
    a) State emergency   b) Financial emergency   c) National emergency   d) All of these

17. The voting right of the citizens in India starts from the age of
    a) 21 years   b) 25 years   c) 30 years   d) 18 years

18. To pass the bill for constitutional amendment under article 368, the procedure is rigid, because it requires the approval by
    a) $1/3^{rd}$ majority of the member of parliament b) $2/3^{rd}$ majority
    c) All the members present and voting   d) Half of the strength of parliament

19. What is the minimum age to become the members of Rajya Sabha and Lok Sabha?
    a)30 years & 25 years b)21 years & 18 years c)35 years & 30 years d)25 years & 35 years

20. Who was the first woman nominated member of the Rajya Sabha?
    a)Indira Gandhi b)Smt.Prathibha Patil c)Smt.Sarojini Naidu d)Smt.RukminiDevi Arundale

21. What is the age of retirement of the judges of the Supreme Court?
    a) 62 years   b) 65 years   c) 60 years   d) 58 years

22. The state emergency can be promulgated by the president of India on the ground of
    a) Constitutional crisis in the state (Breakdown of constitutional machinery in the state)
    b) Waging of war by foreign country
    c) Natural calamity in the state   d) Internal disturbance

-C2-

23. The concept of 'Judicid Review' is borrowed from
    a) U.K   b) U.S.A   c) U.S.S.R   d) Switzerland

24. Which of the following is not the function of the election commission?
    a) Allotting symbols to political parties   b) Framing of code of conduct for election
    c) Selection of candidates for election   d) Preparation of electoral rolls

25. Who is empowered to amend any Provisions of the Constitution Under Art. 368?
    a) Parliament   b) President
    c) Law Minister   d) Cabinet headed by Prime Minister

26. Literal meaning of 'Quo Warranto' is
    a) to command   b) on what authority?
    c) you may have the body   d) to quash the decision of lower court

27. Who is the Constitutional head of the state government?
    a) President   b) Governor   c) Chief Minister   d) Prime Minister

28. Freedom of Speech and Expression guaranteed by the constitution under Article 19 is subject to reasonable restrictions on the ground of
    a) protection of SCs and STs   b) sovereignty and integrity of India
    c) securing the dignity of the office of Prime Minister   d) none of these

29. Which one is not included under Directive Principles of State Policy?
    a) To protect and improve the environment, and to safeguard forests and wildlife
    b) To bring about prohibition of consumption of intoxicating liquor
    c) To take stringent measures to eliminate corruption
    d) To provide Free and Compulsory education to the children upto the age of 14 years.

30. Which provision under Part – IV provides for the encouragement of settlement of international disputes by arbitration?
    a) Art. 44   b) Art. 39   c) Art. 51   d) Art. 50

31. The writ of 'mandamus' will not be issued against
    a) President of India   b) Prime Minister of India
    c) Administrative authorities   d) Tribunal

32. What is the term of the members of Rajya Sabha?
    a) 5 years   b) 6 years   c) 4 years   d) 3 years

33. Who is presiding over the Joint-Session of the Parliament?
    a) Prime Minister   b) President   c) Speaker of Loka Sabha   d) Law Minister

34. One of the Tests to be adopted for the classification People into categories under Article 14 is
    a) intelligible differentia   b) intelligent quotient   c) age   d) caste

35. 'Creamy Layer' relating to reservation of public employment means.
    a) Highly – educated persons   b) Highly cultured persons
    c) Persons having higher annual incomes   d) Public servants having top posts

36. The protection to criminals under Art. 2.0, "No person shall be prosecuted and punished for the same offence more than once" is
    a) Ex-Post facto law   b) Self-Incrimination   c) Double Jeopardy   d) Capital punishment

37. Who is empowered to promulgate an ordinance at the centre when there is no session?
a)Speaker of Lok Sabha b)Prime Minister c)President of India d)Vice President of India

38. Under which schedule the distribution of legislative powers are enumerated in India constitution?
a) Schedule 10th b) Schedule 9th c) Schedule 5th d) Schedule 7th

39. Which article under the constitution gives power to Election Commission to conduct elections?
a) 234   b) 320   c) 324   d) 368

40. By what Amendment, child education between the ages of 06 and 14 years is made compulsory?
a) 42nd Amendment, 1976   b) 86th Amendment, 2002
c) 68th Amendment, 2000   d) 44th Amendment, 1978

41. The main objectives and values of the constitution have been enshrined in
a) Fundamental rights   b) fundamental duties
c) directive principles of state policy   d) preamble of the constitution.

42. India is called a 'Republic' because
a) The people of India are sovereign.
b) In India, the head of the nation is elected by the people for a fixed term.
c) The Prime Minister who is the head of the cabinet is elected by the people.
d) India is the union of states.

43. What is the source of political/democratic power in India?
a) People   b) Constitution   c) Parliament   d) King dynasty.

44. Which of the following Act made the Indian legislature bicameral for the first time?
a) Indian councils Act, 1909   b) Government of India Act, 1919
c) Government of India Act, 1935   d) Indian independence Act, 1947.

45. Who among the followings was appointed as the Chairman of the drafting committee of the constitution?
a) Dr.Rajendra Prasad   b) M.N. Roy   c) Dr.B.R.Ambedkar   d) Jawaharlal Nehru.

46. In which case did Supreme Court hold that the preamble was a part of the constitution?
a) Berubari case   b) Golaknath case
c) Keshvananda Bharathi case   d) Menaka Gandhi case.

47. Under which article and part of the constitution the fundamental duties are enshrined?
a) Article 39A and Part-IV   b) Article 51A and Part-IV A
c) Article 21A and Part-III   d) None of these.

48. The Parliament has enacted a law to prohibit 'child labour' on the authority of
a) Article 15   b) Article 16   c) Article 23   d) Article 24

49. 'Right to life and personal liberty' includes right to
a) Move freely anywhere within the territory of India.
b) Practice any profession or to carryon any trade or business.
c) Privacy.   d) Mercy killing.

50. Who is the present nominal head of the nation?
a)Shri.Pranab Mukharjee b)Smt.Prathiba Patil c)Dr.Manmohan Singh d)Smt.Sonia Gandhi

*****
-C4-

USN ☐☐☐☐☐☐☐☐☐☐

Question Paper Version : A

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 concept spheres of the environment is having the least storage capacity for matter?
   a) Atmosphere   b) Lithosphere   c) Hydrosphere   d) Biosphere

2. Atmosphere consists of 79% Nitrogen and 21% Oxygen by
   a) Volume   b) Weight   c) Density   d) All of these

3. Which pyramid is always upright
   a) Energy   b) Biomass   c) Numbers   d) Foodchain

4. Organisms which feed directly or indirectly on producers are called
   a) prey   b) consumers   c) decomposers   d) detritus

5. World Environment day is on
   a) 5th May   b) 5th June   c) 18th July   d) 16th August

6. In order to protect the health of people along the adjoining areas of roads, one should
   a) Plant trees along side of the roads   b) Not allow diesel driven vehicles
   c) Shift them (people) to other places   d) None of these.

7. 'Earth Day' is held every year on
   a) June 5th b) November 23rd c) April 22nd d) January 26th

8. The adverse effect of modern agriculture is
   a) water pollution   b) soil degradation   c) water logging   d) all of these

9. Organic Farming is
   a) Farming without using pesticides and chemical fertilizers.
   b) Enhances biodiversity
   c) Promotes soil biological activity
   d) All of these.

10. Effect of modern agriculture on soil is due to
    a) Erosion   b) Acidification   c) Salinization   d) All of these

11. Bio – remediation means the removal of contaminants from
    a) Soil   b) Wastewater
    c) Groundwater   d) Both soil & Groundwater

12. What would you do to prevent environmental damage
    a) Plant trees   b) Halt deforestation   c) Control pollution   d) All of these

13. Which of the following is a key element of EIA
    a) Scoping   b) Screening
    c) Identifying and evaluating alternatives   d) All of these

14. The term 'Environment' has been derived from the French word ...... which means to encircle or surround.
    a) Environ   b) Oikos   c) Geo   d) Aqua

15. In an ecosystem the flow of energy is
    a) Bidirectional   b) Cyclic   c) Unidirectional   d) Multidirectional

16. What percentage of its geographical area of a country should be under forest cover
    a) 23%   b) 43%   c) 13%   d) 33%

17. India has the largest share of which of the following
    a) Manganese   b) Mica   c) Copper   d) Diamond

18. Out of the following nutrients in fertilizer, which one causes minimum water pollution
    a) Nitrogen   b) Phosphorous   c) Potassium   d) Organic matter

19. Sulphur occurs in soil and rocks in the form of
    a) Oxides of Zn & Fe   b) Sulphates of Zn & Fe
    c) Nitrates of Zn & Fe   d) Sulphides of Zn & Fe

20. Live stock wastes release large amount of .... into environment.
    a) NH_4 b) NH_3 c) NO_3 d) NO_4

21. Cholera and typhoid are caused by
    a) Worms   b) Virus   c) Bacteria   d) Fungus

22. Solar radiation consists of
    a) UV   b) Visible light   c) Infrared   d) All of these

23. Which resources are inexhaustible
    a) renewable   b) fossil fuel   c) non renewable   d) mineral

24. Problems of hydrogen fuel cell is
    a) Storage and distribution   b) Availability of hydrogen
    c) Creates pollution   d) None of these

25. Nuclear fusion uses the following as a fuel
    a) Carbon   b) Helium   c) Hydrogen   d) Water

26. Molasses from sugar industry is used to generate
    a) Biodiesel   b) Hydrogen   c) Bioethanol   d) Biomethanol

27. Which of the following are biodegradable pollutants
    a) plastics   b) domestic sewage   c) detergent   d) all of these

28. The liquid waste from baths and kitchens is called
    a) Sullage   b) Domestic sewage c) Storm waste   d) Run off

29. Which of the following industry generates coloured waste
    a) Software Industry   b) Textile Industry
    c) Biomedical Industry   d) None of these

30. Sound beyond which of the following level can be regarded as a pollutant
    a) 40 dB   b) 80 dB   c) 120dB   d) 150dB

31. Smog is
    a) A natural phenomenon   b) Combination of smoke and fog
    c) Colourless   d) All of these

32. "Minamata disease" is caused due to
    a) Lead   b) Arsenic   c) Mercury   d) Cadmium

33. Increase in asthma attacks has been linked to high levels of
    a) Nitrogen   b) Oxygen
    c) Air – borne dust particles   d) All the these

34. Population explosion will cause
    a) Biodiversity   b) Stress on ecosystem
    c) More employment   d) None of these

35. Demography is the study of
    a) Animal behavior b) Population growth c) River   d) None of these

36. The first of the major environmental protection act to be promulgated in India was
    a) Water act   b) Air act
    c) Environmental act   d) Noise pollution rules

-A3-

37. The international protocol to protect the ozone layer is
   a) Vienna protocol   b) Kyoto protocol   c) Cartagena protocol   d) Montreal protocol

38. Which of the following is an air pollutant
   a) Carbon dioxide   b) Oxygen   c) Nitrogen   d) Particulate matter

39. Reduction in brightness of the famous Taj Mahal is due to
   a) Global warming   b) Air pollution   c) Ozone depletion   d) Afforestation

40. Ozone layer thickness is measured in
   a) PPM   b) PPB   c) Decibels   d) Dobson units

41. Formation of ozone layer is explained by
   a) Rosen mund reaction   b) Henderson's reaction
   c) Chapman's reaction   d) Perkin's reaction

42. Which of the following is the purpose of animal husbandry
   a) Conservation of animal husbandry   b) Production of meat
   c) Conservation of wild life   d) Conservation of forests

43. Ozone hole was first discovered over
   a) Arctic   b) Antarctica   c) Tropical region   d) Africa

44. Bhopal gas tragedy caused due to leakage of
   a) Methyl ISO cyanate (MIC)   b) Sulphur dioxide
   c) Mustard gas   d) Methane

45. The Wild Life Protection Act was enacted in the year
   a) 1986   b) 1974   c) 1994   d) 1972

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

47. Which of the following animals is endangered species of India
   a) Black buck   b) Elephant   c) Fox   d) Giraffe

48. ISO 14000 standards deal with
   a) Pollution management   b) Risk management
   c) Environmental management   d) None of these

49. The first International Earth summit was held at
   a) Johannesburg   b) Rio de Janeiro   c) Kyoto   d) Stockholm

50. The committee which submitted its report to Government of India on Environmental education is
   a) Tiwari committee   b) Mehta committee
   c) Banerjee committee   d) Agarwal committee

* * * * *

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 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 radius of curvature for the catenary of uniform strength $y = a \log \sec\left(\dfrac{x}{a}\right)$ is

 A) $a \tan\left(\dfrac{x}{a}\right)$ B) $a \sec\left(\dfrac{x}{a}\right)$ C) $a \cos\left(\dfrac{x}{a}\right)$ D) none of these

ii) The radius of the circle of curvature is
 A) 1   B) ρ C) $1/\rho$ D) ρ^2

iii) The Cauchy's mean value theorem for the function $f(x) = e^x$, $g(x) = e^{-x}$ in the interval [3, 7] is
 A) C = 4   B) C = 2   C) C = 5   D) C = 7

iv) Maclaurin's expansion of e^x is

 A) $1 + x + \dfrac{x^2}{2!} - \dfrac{x^3}{3!} + ...$ B) $1 + x + x^2 + x^3 + ...$

 C) $1 + x - \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + ...$ D) $1 + x + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + ...$ **(04 Marks)**

 b. Show that the radius of curvature of the curve $r^n = a^n \cos n\theta$ varies inversely as r^{n-1}.
   (04 Marks)
 c. State and prove Cauchy's mean value theorem.   **(06 Marks)**
 d. Expand $\log(1 + \sin x)$ in powers of x by Maclaurin's theorem upto the term containing x^4.
   (06 Marks)

2 a. Choose the correct answers for the following :

i) $\displaystyle\lim_{x \to 0} \dfrac{1 - \cos x}{x \log(1 + x)}$ is equal to

 A) 1   B) 2   C) 1/2   D) $\sqrt{2}$

ii) If $rt - s^2 > 0$, $r > 0$ then f(a, b) is
 A) maximum value of f(x, y)   B) minimum value of f(x, y)
 C) saddle point   D) none of these

iii) The minimum value of $x^2 + y^2 + z^2$ when $x + y + z = 3a$ is
 A) 3a   B) $9a^2$ C) $3a^2$ D) $3a^3$

iv) If x, y, z are the angles of a triangle, then the maximum value of cos x. cos y. cos z is
 A) 5/8   B) 3/8   C) 7/8   D) 1/8   **(04 Marks)**

2 b. Evaluate $\lim\limits_{x \to 0} \left(\dfrac{\tan x}{x} \right)^{\frac{1}{x^2}}$. (04 Marks)

c. Expand $\tan^{-1}\left(\dfrac{y}{x} \right)$ about the point $(1, 1)$ upto third degree terms. (06 Marks)

d. Examine the function $\sin x + \sin y + \sin (x + y)$ for extreme values. (06 Marks)

3 a. Choose the correct answers for the following :

i) $\int\limits_{0}^{1} \int\limits_{x}^{\sqrt{x}} xy \, dydx$ is equal to

A) 1/12   B) 1/24   C) 1/48   D) 1/17

ii) $\int\limits_{-1}^{1} \int\limits_{0}^{z} \int\limits_{x-z}^{x+z} (x + y + z) \, dydxdz$ is equal to

A) −1   B) +1   C) 0   D) 1/2

iii) The value of $\Gamma\left(\dfrac{1}{2} \right)$ is equals to

A) $\sqrt{\pi}$ B) π C) $\pi/2$ D) $\sqrt{\pi}/2$

iv) The value of $\beta\left(\dfrac{1}{2}, \dfrac{1}{2} \right)$ is equal to

A) 2   B) 5.678   C) 3.1416   D) 2.718 (04 Marks)

b. Evaluate $\iint y \, dxdy$ over the region bounded by the first quadrant of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$. (04 Marks)

c. Evaluate $\int\limits_{0}^{a} \int\limits_{0}^{x} \int\limits_{0}^{x+y} e^{x+y+z} \, dzdydx$. (06 Marks)

d. Express $\int\limits_{0}^{1} x^m (1 - x^n)^p \, dx$ in terms of beta functions and hence evaluate $\int\limits_{0}^{1} x^5 (1 - x^3)^{10} \, dx$. (06 Marks)

4 a. Choose the correct answers for the following :

i) $\vec{F}$ is said to be irrotational if

A) $\Phi_c \vec{F}.\vec{dr} = 0$ B) $\Phi_c \vec{F} \times \vec{dr} = 0$ C) $\Phi_c \vec{F} = 0$ D) None of these

ii) If $\vec{F} = xyi + yzj + zxk$, then $\int\limits_{c} \vec{F}.\vec{dr}$ is where 'c' is the curve is given by $x = t$, $y = t^2$, $z = t^3$, $-1 \le t \le 1$ is

A) 7/10   B) 10/7   C) 8/7   D) 7/9

iii) Gauss divergence theorem gives the relation between
A) a surface integral and a volume integral
B) a line integral and a volume integral
C) a line integral and a surface integral
D) two volume integrals

iv) The divergence of the vector $\vec{V} = z \sin \phi \, \hat{e}_p + z \cos \phi \, \hat{e}_\phi - p \cos \phi \, \hat{e}_z$ is

A) zero   B) -1   C) +1   D) 2 (04 Marks)

4 b. Find the area of the asteroid $x = a \cos^3 \theta$, $y = a \sin^3 \theta$ by employing Green's theorem. (04 Marks)

   c. Derive the expression for curl $\vec{A}$ in orthogonal curvilinear coordinates. (06 Marks)

   d. Express the vector $\vec{A} = zi - 2xj + yk$ in cylindrical coordinates. (06 Marks)

PART – B

5 a. Choose the correct answers for the following :

   i)   The general solution of $(D^2 + a^2) y = 0$ is

   A) $y = G \cos ax + C_2 \sin ax$ B) $y = Ge^{ax} + C_2 e^{-ax}$

   C) $y = G \cos ax - C_2 \sin ax$ D) None of these

   ii) The P.I of the differential equation $6y'' + 17y' + 12y = e^{-x}$ is

   A) e^{-x} B) $-e^{-x}$ C) $2e^{-x}$ D) $3e^{-x}$

   iii) If $f(D) = D^2 + 5$, $\dfrac{1}{f(D)} \sin 2x$ is

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

   iv) By the method of undetermined coefficients y_p of $y'' + 3y' + 2y = 12x^2$ is

   A) $a + bx + cx^2$ B) $a + bx$ C) $ax + bx^2 + cx^3$ D) None of these (04 Marks)

   b. Find the PI of $(D^3 + 1) = \cos(2x - 1)$. (04 Marks)

   c. Solve the equation $\dfrac{d^2 y}{dx^2} + \dfrac{dy}{dx} = x^2 + 2x + 4$. (06 Marks)

   d. Solve by the method of undetermined coefficients $\dfrac{d^2 y}{dx^2} + \dfrac{2dy}{dx} + 4y = 2x^2 + 3e^{-x}$. (06 Marks)

6 a. Choose the correct answers for the following :

   i)   By the method of variation of parameters the value w is called

   A) Wronskian of the function   B) Euler's function

   C) Leibnitz's function   D) None of these

   ii) The general solution of $x^2 \dfrac{d^2 y}{dx^2} + 4x \dfrac{dy}{dx} + 2y = 0$ is

   A) $Gx + C_2 x^2$ B) $Gx^{-1} + C_2 x^{-2}$ C) $(Gx + C_2 x)e^{-x}$ D) None of these

   iii) To transform $\dfrac{x^2 d^2 y}{dx^2} - \dfrac{xdy}{dx} + y = \log x$ into a linear differential equation with constant coefficient, put x =

   A) e^{-t} B) e^t C) e^{-2t} D) $\log t$

   iv) The value of Wronskian w for the equation $y'' + 4y = 4 \sec^2 2x$ is

   A) 2   B) -2 C) 1   D) -1 (04 Marks)

   b. Solve $\dfrac{x^2 d^2 y}{dx^2} + \dfrac{xdy}{dx} + y = \log x \sin(\log x)$. (04 Marks)

   c. Solve by the method of undetermined coefficients $y'' - 5y' + 6y = e^{3x} + x$. (06 Marks)

   d. Solve $(1 + x)^2 \dfrac{d^2 y}{dx^2} + (1 + x) \dfrac{dy}{dx} + y = \sin 2[\log(1 + x)]$. (06 Marks)

7 a. Choose the correct answers for the following :
   i) Laplace transform of (t cos at) is
       A) $\dfrac{s^2 - a^2}{(s^2 + a^2)^2}$　　B) $\dfrac{s^2 + a^2}{(s^2 - a^2)^2}$　　C) $\dfrac{s^2}{s^2 - a^2}$　　D) $\dfrac{s^2}{(s^2 - a^2)^2}$

   ii) Laplace transform of cos 3t is
       A) $\dfrac{s}{s^2 + 9}$　　B) $\dfrac{s}{s^2 + 3}$　　C) $\dfrac{s}{s^2 - 9}$　　D) None of these

   iii) Laplace transform of f′(t) is
        A) SL{f(t)} – f(0)　　B) SL{f(t)} – f′(0)　　C) F(S)　　D) None of these

   iv) A unit step function is defined as
       A) $u(t-a) = \begin{cases} 0, & t < a \\ 1, & t \ge a \end{cases}$ 　　B) $u(t-a) = \begin{cases} 1, & t > a \\ 0, & t \ge a \end{cases}$

       C) t – a = 0　　D) None of these　　(04 Marks)

   b. Find the Laplace transform of $e^{-4t}\, t^{-5/2}$.　　(04 Marks)

   c. Find the Laplace transform of $\dfrac{\cos at - \cos bt}{t}$.　　(06 Marks)

   d. Find the Laplace transform of the function using unit step function
      $$f(t) = \begin{cases} 1, & 0 < t < 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}$$　　(06 Marks)

8 a. Choose the correct answers for the following :
   i) Inverse Laplace transform of $\dfrac{s}{(s^2 + a^2)^2}$ is
       A) $\dfrac{t^2 \sin at}{2a}$　　B) $\dfrac{t \sin at}{2a}$　　C) $\dfrac{t \cos at}{2a}$　　D) None of these

   ii) Inverse Laplace transform of $\log\left(\dfrac{s+a}{s+b}\right)$ is
       A) $\dfrac{e^{at} - e^{bt}}{t}$　　B) $\dfrac{e^{-bt} - e^{-at}}{t}$　　C) $\dfrac{e^{bt} - e^{at}}{t}$　　D) None of these

   iii) Inverse Laplace transform of $\dfrac{1}{s}f(s)$ is
        A) $\displaystyle\int_0^t f(t)dt$　　B) $\displaystyle\int_0^t t\,dt$　　C) $\displaystyle\int_0^t tf(t)dt$　　D) None of these

   iv) $L^{-1}\left(\dfrac{1}{s^n}\right)$ is possible only when n is
       A) n > 1　　B) n ≥ -1　　C) n = 1　　D) n < 1　　(04 Marks)

   b. Find the inverse Laplace transform of $\dfrac{3s+2}{s^2 - s - 2}$.　　(04 Marks)

   c. Using the convolution theorem, obtain the inverse Laplace transform of $\dfrac{s^2}{(s^2 + a^2)^2}$.　　(06 Marks)

   d. Solve the DE $y'' + 4y' + 3y = e^{-t}$ with y(0) = 1, y′(0) = 1 using Laplace transform.　　(06 Marks)

* * * * *