Code No: R21016 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICS - III
(Com. to CE, CHEM, BT, PE)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)\,dx = 0, if\ \alpha \neq \beta$.

   b) Prove that $\int_{-1}^{1} x^m\, p_n(x)\, dx = 0$ if m<n using Rodrigue's formula. (8M+7M)

2. a) Derive the necessary and sufficient condition for *f(z)* to be analytic in Cartesian coordinates.

   b) Find the conjugate harmonic of $u = e^{x^2 - y^2}$. Hence find *f(z)* in terms of z.
(8M+7M)

3. a) Write the real and imaginary parts of tanz.

   b) Find all the values of $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^{(1+i\sqrt{3})}$ (8M+7M)

4. a) Evaluate $\oint_C \frac{z-3}{z^2+2z+5}\, dz$ where C is |z+1-i | =2 using Cauchy's Integral formula.

   b) Verify Cauchy's theorem for the function $f(z) = 3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i\ and\ -1 \pm i$. (7M+8M)

5. a) Find the Taylor's series expansion of *cosz* about $z = \pi i$.

   b) Expand the Laurent series of $\frac{z^2 - 1}{(z+2)(z+3)}\ for |z| > 3$. (8M+7M)

6. a) Define pole and determine the residues at each pole for f $f(z) = \frac{z^2}{(z+1)^2(z+2)}$.

   b) Expand $f(z) = \frac{e^z}{(z-1)^2}$ as a Laurent series about z = 2 and hence find the residue at that point. (7M+8M)
~~~~~~~~~~~~~~~~~~~~~~

7. a) State and prove Rouche's theorem.
   b) Show that the equation $z^4+4(1+i)z+1=0$ has one root in each quadrant. (7M+8M)

8. a) Define transformation. Under the transformation $\omega = \frac{1}{z}$ find the image of the circle $|z-2i| = 2$.
   b) Find the bilinear transformation which maps the points $(1,i,-1)$ into the points $(0,1,\infty)$ (8M+7M)

Code No: R21016 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICS - III
(Com. to CE, CHEM, BT, PE)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove that $J_n(-x) = (-1)^n J_n(x)$ where 'n' is a positive or '-'ve integer.
   b) Prove that $\int_{-1}^{1} p_m(x)\, p_n(x)\, dx = 0 \ if \ m \neq n$. (8M+7M)

2. a) Show that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log\left|f^1(z)\right| = 0$ where f(z) is an analytic function.
   b) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic find $f(z) = u + iv$. (8M+7M)

3. a) Separate the real and imaginary parts of tan hz.
   b) If tan (log (x+iy)) = a+ib where $a^2 + b^2 \neq 1$. Show that $\frac{2a}{1 - a^2 - b^2}$ = tan $(\log(x^2 + y^2))$.
   (7M+8M)

4. a) Verify Cauchy's theorem, for the integral of z^3 taken over the boundary of the rectangle with vertices -1, 1, 1+i, -1+i.
   b) Use Cauchy's integral formula $\oint_C \frac{z^3 - 2z + 1}{(z - i)^2} dz$ where C is the circle |z| = 2. (8M+7M)

5. a) Define circle of convergence and find the Taylor's series expansion of $f(z) = \frac{1}{z}$ about the point z = 1.
   b) Obtain the Laurent's series expansion of $f(z) = \frac{e^z}{z(1 - z)}$ about z =1. (8M+7M)

6. a) Define Residue at a pole of order m.
   b) Show that $\int_0^{\pi} \frac{d\theta}{a^2 + \sin^2\theta} = \frac{\pi}{a\sqrt{1 + a^2}} \ for \ a > 0$. (7M+8M)

7. a) State Rouche's theorem and use it to find the no. of zeros of the polynomial $z^8 - 4z^5 + z + 1$ that lie inside the circle |z| = 1.
   b) State and prove Liouville's theorem. (8M+7M)

8. a) Define conformal mapping.
   Find the image of the circle |z| = 2, under the transformation ω = z+3+2i.
   b) Determine the Bilinear transformation which maps z=0, 2i, -2i into $\omega = -1, 0, \infty$ (7M+8M)
~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21016 **R10**

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICS - III
(Com. to CE, CHEM, BT, PE)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove that $J_{3/2}(x) = \sqrt{\frac{2}{\pi x}}\left[\frac{1}{x}\sin x - \cos x\right]$.
   b) Show that $x^3 = \frac{2}{5}p_3(x) + \frac{3}{5}p_1(x)$. (8M+7M)

2. a) Prove that if $u = x^2 - y^2,\ v = \frac{-y}{x^2+y^2}$ both u and v satisfy Laplace's equation, but $u + iv$ is not regular (analytic) function of z.
   b) Find the analytic function whose real part is $y + e^x$ cosy. (8M+7M)

3. a) Find the real part of the principal value of $i^{\log(1+i)}$.
   b) Prove that $\tan^{-1} z = \frac{i}{z}\log\left(\frac{i+z}{i-z}\right)$ (8M+7M)

4. a) Show that $\oint_C (z+1)dz = 0$ where C is the boundary of the square whose vertices at the points z = 0, z=1, z=1+i, z=i.
   b) Evaluate $\oint_C \frac{e^z dz}{(z+1)^4}$ around c: |z-1| =3. (8M+7M)

5. a) Define power series and expand $f(z) = \frac{z-1}{z+1}$ in Taylor's series about the point z =0.
   b) Define the different types of singularities. (8M+7M)

6. a) State and prove Cauchy's residue theorem.
   b) Find the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at z =0.5. (8M+7M)

7. a) If the real number a >e, prove by using Rouche's theorem, that the equation $e^z = a z^n$ has n roots inside the unit circle.
   b) State and prove 'Fundamental theorem of Algebra'. (8M+7M)

8. a) Find the image of |z| = 2 under the transformation $\omega = 3z$.
   b) Determine the bilinear transformation that maps the points 1-2i, 2+i, 2+3i, respectively into 2+2i, 1+3i, 4. (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~

Code No: R21016 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICS - III
(Com. to CE, CHEM, BT, PE)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove that $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$.
   b) Prove that $(2n+1)\, p_n(x) = p_{n+1}^1(x) - p_{n-1}^1(x)$. (8M+7M)

2. a) Show that f(x) = cos z is analytic everywhere in the complex plane and find $f^1(z)$.
   b) Show that the function $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic and find its conjugate. (8M+7M)

3. a) Find all the roots of the equation cos z = 2.
   b) If cosh $(u+iv) = x+iy$ then prove that:
   $\frac{x^2}{\cosh^2 u} + \frac{y^2}{\sinh^2 u} = 1$ (8M+7M)

4. a) Evaluate $\int_{1-i}^{2+i} (2x+1+iy)\, dz$ along the straight line joining (1, -i) and (2, i).
   b) Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2}\, dz$ where C is |z| = 4. (8M+7M)

5. a) Find the Maclaurin's series expansion of f(z) for log (i+z).
   b) Let $f(z) = \frac{1}{(1-z)(z-2)}$, write the Laurent series expansion in |z| >2. (8M+7M)

6. a) Show that $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta} = \frac{\pi}{\sqrt{a^2-b^2}} (a > b > 0)$.
   b) Find the poles of the function $f(z) = \frac{1}{(z+1)(z+3)}$ and residues at these poles. (8M+7M)

7. a) Show that the equation z^4 + 4 (1+i) z+1 =0 has one root in each quadrant.
   b) State and prove argument principle. (8M+7M)

8. a) Show that the relation $\omega = \frac{5-4z}{4z-2}$ transform the circle |z| = 1 into a circle of radius unity in the $\omega - plane$.
   b) Define Bilinear transformation. Find the bilinear transformation that maps the points $(\infty, i, 0)$ in to the points $(0, i, \infty)$ (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21024 **R10** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and prove Gauss's law as applied to an electric field and determine the field due to an infinite line charge.
   b) Show that the electric filed intensity at any point inside a hollow charged spherical conductor is zero.

2. a) In a certain region the potential is given by $V = x^2 + 5y^2 + 4z^2$. Find the electric field intensity at a point (1, -2, 3) m.
   b) Show that the torque on a physical dipole $\overline{P}$ in a uniform electric filed $\overline{E}$ is given by $\overline{P} \times \overline{E}$. Extend this result to a pure dipole.
   c) Explain behavior conductors in an electric field.

3. a) State and prove the conditions on the tangential and normal components of electric flux density and electric field intensity, at the boundary between the dielectrics.
   b) An aluminum conductor is 304.8m long and has a circular cross section with a diameter of 0.8 inches. If there is a dc voltage of 2.0V between the ends find (i) the current density (ii) the current (iii) the Power dissipated.

4. a) State and explain Biot-Savart's law and derive the expression for the magnetic field at a point due to an infinitely long conductor carrying current.
   b) A circuit is having a direct current of 5 amps form a regular hexagon inscribed in a circle of radius 1 m. Calculate the magnetic flux density at the center of the circular hexagon. Assume the medium to be free space.

5. a) What are the limitations of Ampere's current law? How this law can be modified to time varying field.
   b) A square loop 10 cm on a side has 500 turns that are closely and tightly wound and carries a current of 120 A. Determine the magnetic flux density at the centre of the loop.

6. a) What is a magnetic dipole? How does a magnetic dipole differ from an electric Dipole? Explain about magnetic dipole moment.
   b) Derive the expression for force between two long parallel current carrying conductors placed in a magnetic field.

7. a) Explain the concept of vector and scalar magnetic potentials.
   b) Derive the Neumann's formulae for the calculation of self and mutual inductances.

8. a) Explain about Poynting vector.
   b) Find the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^{-4}$ mho/m and $\epsilon_R = 81$.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21024 **R10** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and explain Coulomb's law to determine force between two point charges.
   b) Find the electric field intensity at a point P_1 (0, 1, 2) m due to charge Q_1=300 nC, located at P_2 (2, 0, 3) m in free space.

2. a) Discuss the behavior of conductors in an electric field.
   b) Develop an expression for potential difference at any point between two spherical shells in terms of the applied potential. Use Laplace equation.

3. a) Derive an expression for capacitance between two concentric spherical shells.
   b) Derive the expression for continuity equation.

4. a) Find the expression for the magnetic flux density, 'B' at a distance 'h' above the centre of a rectangular loop of wire 'b' meters on one side and 'a' meters on the other side. The loop carries a current of one ampere.
   b) A single turn circular coil of 50 m in diameter caries a current of 28×10^4 amperes. Determine the magnetic field intensity H at a point on the axis of coil and 100 m from the coil. The μ_r of free space is unity.

5. a) Show that $\nabla \times \vec{H} = \vec{J}$.
   b) Find the vector magnetic field intensity H at a point P (2.5, 2, 3) m caused by a current filament of 12 A in $\hat{a}_z$ direction on the z-axis extending from 0 to 6.

6. a) Two conducting filaments extend along the 'x' and 'y' axes, carrying currents I_1 and I_2 in the a_x and a_y directions, respectively. Find the differential force exerted on the differential current element $I_2\, dl_2$ at (0,1,0) m by the differential element $I_1\, dl_1$ at (1,0,0) m.
   b) Derive the expression for torque exerted on a current-carrying loop placed in a magnetic field.

7. a) Derive the expression for magnetic vector potential?
   b) Explain about the Vector Poisson's equation for steady magnetic field.

8. a) Explain the concept of displacement current and obtain an expression for the displacement current density.
   b) Explain the terms: (i) Motional EMF (ii) Static EMF

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~~

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A very thin, finite, and uniformly charged line of length 10m carries a charge of 10 μC/m. Calculate the electric field intensity in a plane bisecting the line at $\rho = 5$ m.
   b) Determine the electric field intensity due to infinite line charge, at a point perpendicular to its plane and at a given distance from the line charge from first principles.

2. a) A uniform charge density of ρ_v C/m^2 exists throughout the volume of a sphere of radius '*b*' meters. Using Poisson's equation, find the value of electric filed intensity and potential at any point inside the sphere for which $0 \le r \le b$.
   b) Derive Poisson's and Laplace equations starting from point form of Gauss Law.

3. a) Derive the point form of Ohm law for conductors.
   b) Derive an expression for the capacity of a spherical capacitor consisting of two concentric spheres of radii a and b, the dielectric medium between the two spheres being air. Henceforth show that the same expression can be written as $C = \frac{\varepsilon_0}{d}\sqrt{A_a A_b}$, where A_a and A_b are the surface areas of the two spheres with radii a and b respectively.

4. a) Derive an expression for magnetic flux density at a point due to a current in a straight conductor of infinitely long straight conductor.
   b) A long solenoid has a radius of 2 cm and a length of 1.2 m. If the number of turns per unit length is 200 and the current is 12 A, calculate the magnetic flux density i) at the Center and ii) at the ends of the solenoid.

5. a) Discuss the application of Amperes circuital law for unsymmetrical surfaces.
   b) A circular loop located on $x^2 + y^2 = 9$, $z = 0$ carries a direct current of 10 A along a_φ direction. Determine H at (0, 0, 5) cm and (0, 0, -5) cm.

6. a) A point charge of value -40 nC is moving with a velocity of 6000 km/sec in a direction specified by the unit vector $\hat{a}_v = -0.48\hat{a}_x - 0.6\hat{a}_y + 0.64\hat{a}_z$. Using Lorentz's force equation, find the force $\overline{F}$ if (a) $\overline{B} = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ mT (b) $\overline{E} = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ kV/m.
   b) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I_1 and I_2.

7. a) Explain the characteristics and applications of permanent magnets.
   b) Derive the expression for inductance of a solenoid.

8. a) Show that power loss in a conductor is given as product of voltage and current using Poynting theorem.
   b) Verify the fields $\vec{E} = E_m sin(\ x)\, sin(\ t)\, \hat{a}_y$ and $\vec{E} = \frac{E_m}{\mu_o} cos(\ x)\, cos(\ t)\, \hat{a}_z$ satisfy Maxwell's equations or not.
~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21024 **R10** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Define electrostatic potential. Discuss the properties of electrical potential function.
 b) Three equal positive charges of 4 nC each are located at three corners of a square side 20 cm. Determine the magnitude and direction of the electric field at the variant corner of the square.

2. a) Derive an expression for torque due to a dipole that is present in an electric field.
 b) Measurement made in the atmosphere show that there is an electric field which varies widely from time to time particularly during thunderstorms. Its average values on the surface of earth at a height of 1550 m were found to be 100 V/m and 25 V/m directed downward towards the earth respectively. Calculate: i) the mean space charge in the atmosphere between 0 and 1500 m altitude ii) Surface charge density on the earth.

3. a) Two parallel conducting plates 5cm apart and situated in air are connected to a source of constant potential difference of 80kV. Find the electric field intensity between the plates if it is within permissible value? If a mica sheet ($\varepsilon_r = 5$) of thickness 2cm is introduced between the plates, determine the field intensity in air and mica.
 b) Derive an expression for Capacitance due to two concentric spherical conductors.

4. a) An air cored toroid having a cross sectional area of 6 cm^2 and mean radius 15 cm is wound uniformly with 500 turns. Determine the magnetic flux density and the field intensity.
 b) A conductor in the form of regular polygon of "n" sides, inscribed in a circle of radius "R". Show that the expression for magnetic flux density $B = \frac{\mu_0 nI}{2\pi R}\tan(\frac{\pi}{n})$ at the centre, where I is the current.

5. a) State and explain Ampere's circuital law and derive the same in point differential form.
 b) Find the magnetic field intensity at centre of a square of sides equal to 5 m and carrying a current equal to 10 A. Derive the formula used.

6. a) State and explain Lorentz's force equation?
 b) A single-phase circuit comprises two parallel conductors A and B, each 5 cm diameter and spaced 10 meter apart. The conductors carry currents of +50 and -50 amperes respectively. Determine the magnetic field intensity at the surface of each conductor and also exactly midway between A and B.

7. a) Obtain the expression for inductance of a toroid.
 b) Derive the expression for energy density in a magnetic field.

8. a) Starting from Faraday's law of electromagnetic induction, derive $\nabla \times E = -\frac{\partial \vec{B}}{\partial t}$.
 b) From the Maxwell's equations, derive the expression for Poynting vector. Also, explain the applications of the Poynting vector.
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21029 **R10 – Regular Students** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain the Coulomb's law for electrostatic field.
   b) If D= $(2y^2+z)\, a_x + 4xy\, a_y + x\, a_z$ C/m^2, find
      i) The volume charge density at (-1, 0, 3)
      ii) The flux through the cube defined by $0\leq x \leq 1$, $0\leq y \leq 1$, $0\leq z \leq 1$
      iii) The total charge enclosed by the cube.

2. a) State and explain Poisson's Law for electrostatic fields.
   b) Obtain expressions for electric potential and electric field intensity due to an electric dipole.

3. a) Explain the concept of displacement current and show that in a capacitor, the conduction current is equal to displacement current.
   b) The relative permittivity of dielectric in a parallel plate capacitor varies linearly from 4 to 8. If the distance of separation of plates is 1 cm and area of cross-section of plates is 12 cm^2, find the capacitance. Derive the formula used.

4. a) State and Explain Biot-Savart's law.
   b) An infinitely long conducting filament is placed along the x-axis and carries current 10 mA in the a_x direction. Find H at (-2, 3, 4). Derive the formula used.

5. a) Derive Maxwell's third equation.
   b) The planes z =0 and z =4 carry current K= -8 a_x A/m and K= 18 a_x A/m, respectively. Determine H at (1, 1, 1).

6. a) Derive the formula for torque on a current loop placed in an uniform magnetic field.
   b) Two differential $I_1\Delta L_1=3\times10^{-6}\, a_y$ A-m at $P_1(1,0,1)$ and $I_2\Delta L_2=3\times10^{-6}\,(-0.5\, a_x+0.4\, a_y+0.7a_z)$ A-m at $P_2(2,2,3)$ are located in free space. Find the vector force exerted on i) $I_1\Delta L_1$ by $I_2\Delta L_2$ ii) $I_2\Delta L_2$ by $I_1\Delta L_1$. Derive the formula used.

7. a) Calculate the self inductance and mutual inductances between two co-axial solenoids of radius R_1 and R_2, where $R_1 > R_2$, carrying a current I_1 and I_2 with n_1 and n_2 turns respectively.
   b) Derive the expression for energy stored and energy density of a magnetic field.

8. a) State and explain Faraday's laws of electromagnetic induction in both integral and differential forms.
   b) Show that power loss in a conductor is given as product of voltage and current using Poynting theorem.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21029 **R10 – Regular Students** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and Explain Gauss's law for electrostatic fields.
   b) Three point charges each 5 nC are located on the x-axis at points: -1, 0 and + 1 m in free space. (i) Find E at x=5. (ii) Determine the value and location of the equivalent single point charge that would produce the same field at very large distance.

2. a) State and explain Laplace's law for electrostatic fields.
   b) Derive the expression for torque produced on the dipole present in an electric field.

3. a) State and explain ohm's law at point form.
   b) A dielectric interface is defined by 4x+3y=10 m. The region including the origin is free space, where D=2 a_x-4ay+6.5 a_z nC/m^2. In the other region ε_{r2} =2.5. Find E_2, D_2 and angle θ_2 that makes with the normal.

4. a) State and explain Biot-Savart's law.
   b) A square conducting loop 4 cm on each side carries a current of 10 A. Calculate the magnetic field intensity at the center of the loop.

5. a) Find the magnetic field intensity at centre of a square of sides equal to 5 m and carrying a current equal to 10 A.
   b) Obtain the magnetic field strength H at all possible locations due to an infinite long co-axial transmission line and sketch H verses distance from the center of inner conductor. Use Ampere's law.

6. a) An electron with velocity u= (3 a_x+12 a_y- 4 a_z) $\times 10^5$ m/s experiences no net force at a point in a magnetic field B=(10 a_x+ 20 a_y+30 a_z) mWb/m^2. Find E at that point.
   b) Two differential $I_1\Delta L_1=4\times10^{-6}$ a_y A-m at P_1(1,0,2) and $I_2\Delta L_2=5\times10^{-6}$ (-0.3 a_x+0.5 a_y+0.7a_z) A-m at P_2(3,3,5) are located in free space. Find the vector force exerted on i) $I_1\Delta L_1$ by $I_2\Delta L_2$ ii) $I_2\Delta L_2$ by $I_1\Delta L_1$. Derive the formula used.

7. a) Calculate the self inductance per unit length of an infinitely long solenoid.
   b) Calculate the self inductance and mutual inductances between two co-axial solenoids of radius R_1 and R_2, $R_1 > R_2$, carrying a current I_1 and I_2 with n_1 and n_2 turns/m respectively.

8. a) State and Explain Poynting theorem.
   b) Starting from Faraday's law of electromagnetic induction, derive $\nabla \times E = -\frac{\partial \vec{B}}{\partial t}$.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21029 **R10 – Regular Students** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A point charge of 30 nC is located at origin, while plane y=4 carries a charge 12 nC/m^2. Find electric flux intensity at (0,-4, 3).
   b) Given that the potential $V = \frac{12}{r^2} \sin\theta \cos\phi$. (i) Find the electric flux density D at (3, π/2, 0) and (ii) calculate the work done in moving a 12 μC charge from point A (1, 30^0,120^0) to B (4,90^0,60^0).

2. a) Show that electric field intensity due to an electric dipole represents a conservative field.
   b) Explain the behavior of conductors in an electric field.
   c) Develop an expression for potential difference at any point between spherical shells in terms of the applied potential employing Laplace equation.

3. a) State and explain the continuity equation.
   b) A spherical capacitor with inner sphere of radius 1.5 cm and outer sphere of radius 3.8 cm has an homogeneous dielectric of $\varepsilon = 10\,\varepsilon_0$. Calculate the capacitance of the capacitor. Derive the formula used.

4. a) Deduce the relationship between magnetic flux, magnetic flux density and magnetic field intensity.
   b) A square conducting loop 5 cm on each side carries a current of 18 A. Calculate the magnetic field intensity at the center of the loop.

5. a) An infinitely long filamentary wire carries a current of 2 A along the z-axis in the +z direction. Calculate the B at (-3, 4, 7).
   b) State and Explain Lorentz force equation.

6. a) Derive the formula for the force between two straight long and parallel current carrying conductors.
   b) Derive the expression for torque exerted on a current-carrying loop by a magnetic field.

7. a) Derive the expression for inductance of a solenoid.
   b) Determine the self inductance of a coaxial cable of inner radius a and outer radius b.

8. a) State and Explain Faradays laws of electromagnetic induction.
   b) Explain the terms: (i) Dynamically induced EMF (ii) Statically induced EMF

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21029 **R10 – Regular Students** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A very thin, finite, and uniformly charged line of length 10 m carries a charge of 10 μC/m. Calculate the electric field intensity in a plane bisecting the line at ρ = 5 m.
   b) Find the work done in moving a charge of 2coulombs from (2, 0, 0) m to (0, 2, 0) along a straight line path joining the two points, if the electric field is $\vec{E} = (2x\,\hat{a}_x - 4y\,\hat{a}_y)$ V/m .

2. a) Derive Poisson's and Laplace's equations starting from point form of Gauss's law.
   b) Given the current density J= $-10^{-4}[\sin(2x)e^{-2y}\,a_x + \cos(2x)\,e^{-2y}\,a_y]$ kA/m^2. Find the total current crossing the plane y=1 in the a_y direction of the region 0<x<1. 0<z<2

3. a) Derive the boundary conditions between a conductor and a dielectric.
   b) Find the angle by which the direction of the electric field intensity changes, as it crosses the boundary between two dielectrics with dielectric constants 4 and 5. The incident angle is 50^0 with the normal.

4. a) Find the expression for the magnetic flux density, 'B' at a distance 'h' above the centre of a rectangular loop of wire 'b' meters on one side and 'a' meters on the other side. The loop carries a current of one ampere.
   b) A square conducting loop 4 cm on each side carries a current of 10 A. Calculate the magnetic field intensity at the center of the loop.

5. a) State and explain Ampere's circuital law.
   b) A circular loop located on $x^2 + y^2 = 9$, z = 0 carries a direct current of 10 A along a_φ direction. Determine H at (0, 0, 5) and (0, 0, -5).

6. a) Two infinitely long parallel conductors are separated by a distance 'D'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I_1 and I_2.
   b) When current carrying wire is placed in a uniform magnetic field show that torque experienced by it is $\overline{T} = \overline{m} \times \overline{B}$.

7. a) Calculate the self inductance per unit length of an infinitely long solenoid.
   b) Derive an expression for mutual inductance between a straight long wire and a square loop wire in the same plane.

8. a) Explain the Maxwell's equations for time varying fields.
   b) A conductor with circular cross-section has a radius 'a' and length 'l'. It is carrying a current 'I' ampere. If the conductivity of conductor is 'σ', find the power loss in the conductor using Poynting theorem.
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21031 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
ENGINEERING MECHANICS
(Com to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and prove Lame's theorem
   b) Three smooth cylinders, each of diameter *d* and weight W are placed in a rectangular channel of width 5times radius of cylinders as shown in Figure1. Determine the reactions at all contact surfaces.

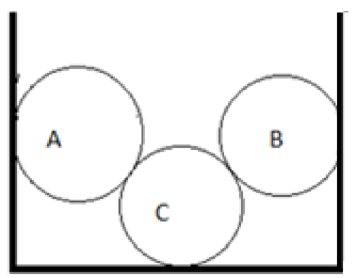


Figure 1

2. a) State parallelogram law of forces.
   b) Determine the resultant of coplanar parallel system shown in Fig.2. All dimensions are in mm. The loads are W_1=10kN,W_2=20kN, W_3=30kN and W_4=40kN

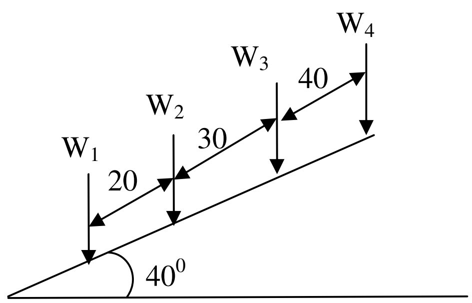


Figure 2.

3. a) State and prove theorems of Pappus.
   b) Determine the centroid of composite section shown in Figure 3.

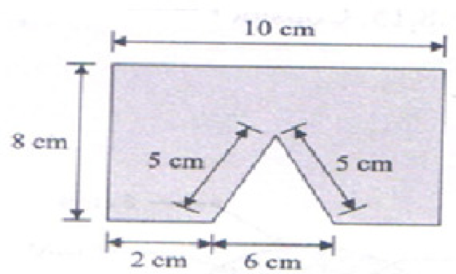


Figure 3
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. Calculate the moment of inertia of the section about an axis parallel to the base of it and passing through its centre of gravity (refer Figure 4).

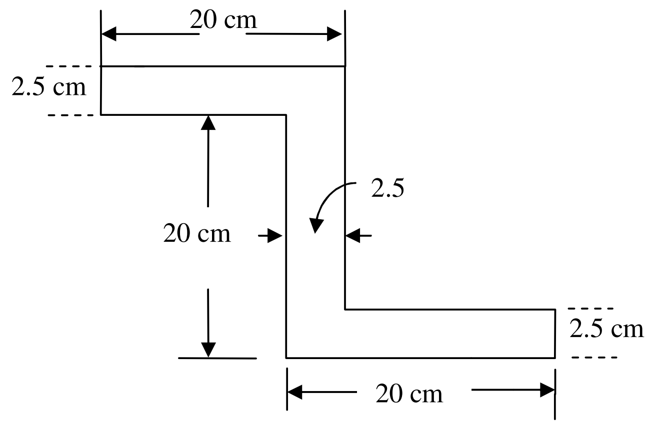


Figure 4

5. a) Enumerate the assumptions made while finding the forces in a frame
b) Determine the forces in all members of the frame in Figure 5 by the method of sections and tabulate the results.

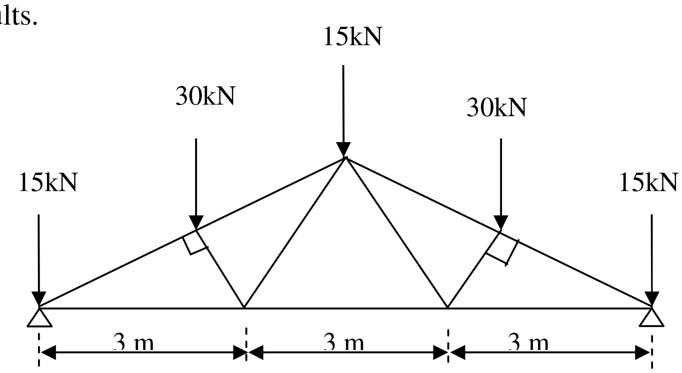


Figure 5

6. A bullet travelling horizontally with a velocity of 600m/sec and weighing .25N strikes a wooden block of weight 50N resting on a rough horizontal floor. The coefficient of friction between the floor and the block is 0.5. Find the distance through which the block is displaced from the initial position.

7. a) What is the energy of motion for a rigid body rotating about a fixed axis?
b) A 70kg sprinter starts from rest and accelerate uniformly for 5.8s over a distance of 34.5m. Neglecting air resistance, determine the average power developed by the sprinter.

8. a) Explain the following: coefficient friction
b) An effort of 1500N is required to just move a certain body up an inclined plane of angle 12^0, force acting parallel to the plane. If the angle of inclination is increased to 18^0, then the effort required is 1800N. Find the weight of the body and the coefficient of friction.

Code No: R21031 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
ENGINEERING MECHANICS
(Com to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. Two smooth spheres each of radius 100mm and weight 100N rest in a horizontal channel having vertical walls, the distance between which is 360 mm as shown in Fig.1. Find the reactions at the point of contacts A, B, C and D of the spheres.

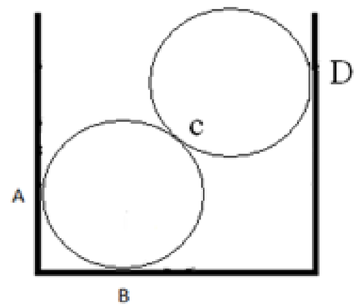


Figure 1

2. a) State and explain equations of equilibrium.
   b) Determine the reactions at A & B of the overhanging beam as shown in Figure 2.

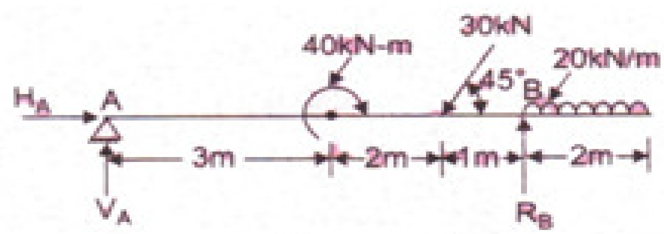


Figure 2

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~~

3. a) State the Lami's theorem.
   b) Determine the centroid of composite section shown in Figure 3.

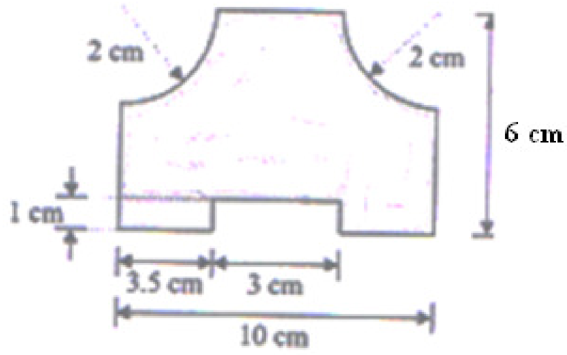


Figure 3

4. Calculate the moment of inertia of T section about an axis parallel to the base of the T and passing through its centre of gravity (refer Fig.4).

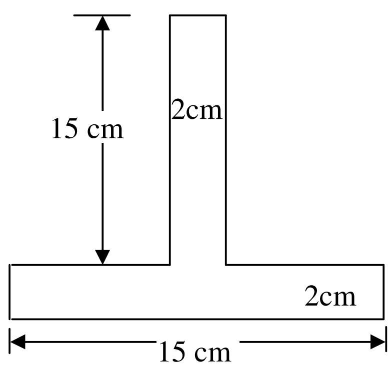


Figure 4

5. a) Explain different types of frames.
   b) Determine the forces in all members of the frame in fig.5 by the method of sections and tabulate the results.

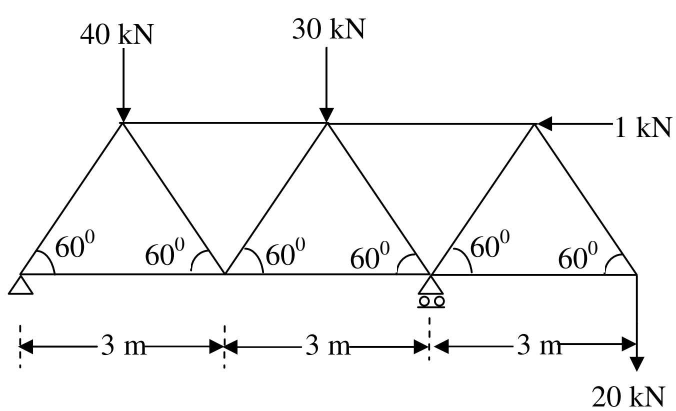


Figure 5

6. a) A stone is dropped from a tall tower of height 180m at the same another one is projected from the foot of the tower with a velocity of 44m/sec. determine when and where the two meet?
   b) A stone is projected so as to just pass over a wall 60m high at a distance of 6m from the point of projection. What is the angle of projectiopn if the velocity of projection is 40m/sec. neglect air resistance.

7. A man of mass 75 kg and a boy of mass 25 kg dive off the end of the boat of the mass 20 kg so that their relative horizontal velocity with respect to the boat is 3m/s. If initially the boat is at rest find its final velocity if a) the two dive off simultaneously b) the man dives first followed by the boy.

8. a) Explain the following: limiting friction and impending friction
   b) A turn buckle used to join two compartments (turn buckle have left start thread on one side and right start threads on other side). Its thread pitch is 12mm and mean diameter 40mm. the coefficient of friction between the nut and thread is 0.18. Determine the work done in drawing the compartments together a distance of 240mm against a steady load of 2500N. If load is doubled for the same distance, what is the work done ?

II B. Tech I Semester, Regular Examinations, Nov – 2012
ENGINEERING MECHANICS
(Com to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. A corner plate ABC is hinged to a fixed support at A and rests on a roller at C. If a force of W is acting at D as shown in Figure 1, find the reactions at the support.

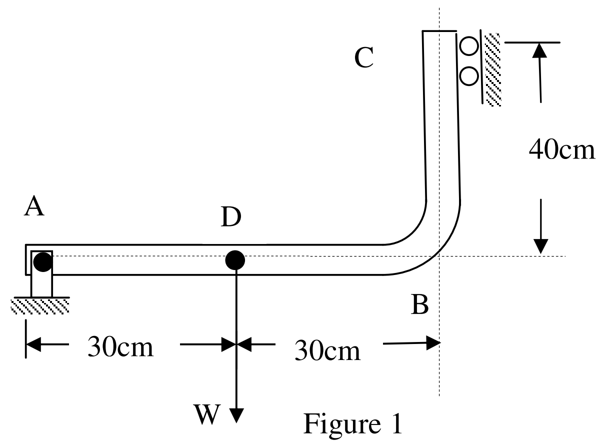


Figure 1

2. a) Explain the method of resolution of forces.
b) A system of forces acting on a body is shown in Figure 2. Determine the resultant. Slope for quadrant 1 force is 1/2 and for second quadrant force is 4/3.

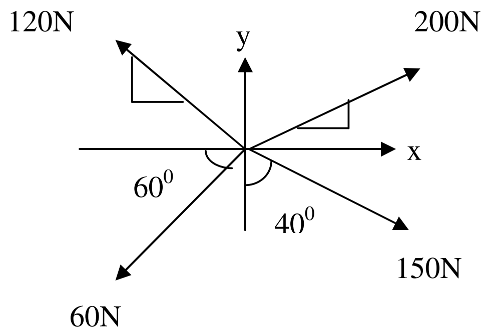


Figure 2

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~~

3. a) State the theorems of Pappus.

   b) Determine the centroid of composite section shown in Figure 3.

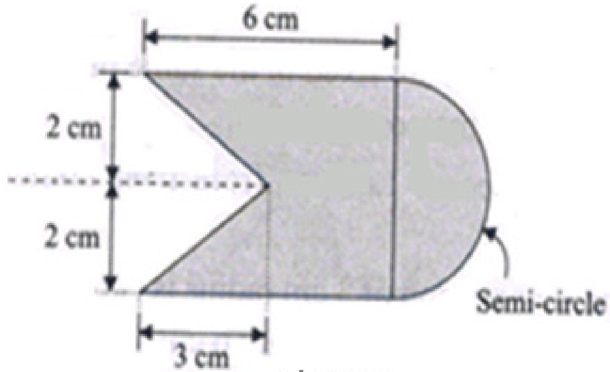


Figure 3

4. Calculate the moment of inertia of the section shown in the Figure 4 about an axis parallel to the base of the section and passing through its centre of gravity

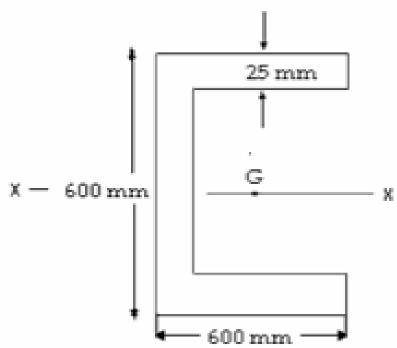


Figure 4

5. Determine the forces in all members of the frame in figure 5 by the method of joints and tabulate the results

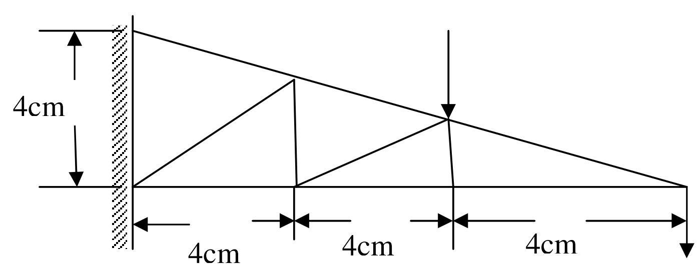


Figure 5

6. a) A fire brigade man wants to extinguish a fire at a height of 6m above the nozzle standing at a distance of 5m away from the fire. Find i) the minimum velocity of the nozzle discharge required. ii) Velocity of discharge if the fireman could extinguish with angle of projection of 60^0.

7. A tram car weighs 120kN, the tractive resistance being 5N/kN. What is the power required to propel the car at a uniform speed of 20kmph?
   i) On level surface ii) up an incline of 1 in 300 and iii) down an inclination of 1 in 300.

8. a) Explain Coulomb's laws of friction
   b) Determine the force required to move a load of 240N up a rough plane. The force is applied parallel to the plane. The inclination of the plane is such that a force of 60N inclined at 30^0 to a similar smooth plane would keep the same load in equilibrium. Coefficient of friction is 0.03.

Code No: R21031 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
ENGINEERING MECHANICS
(Com to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain moment of forces and its applications.
   b) Two equal loads of 2500N are supported by a flexible string ABCD at points B and C as shown in Fig.1.Find the tensions in the portions AB, BC and CD of the string.

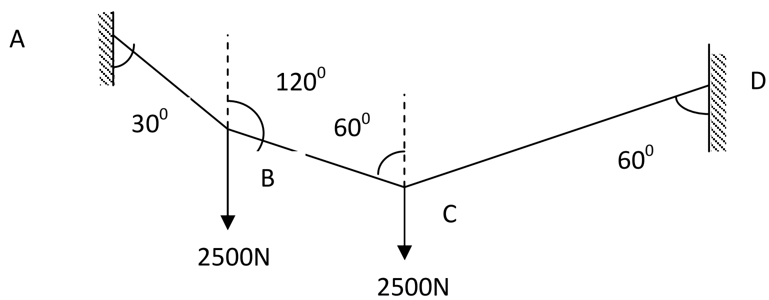


Figure 1

2. a) State Lami's theorem.
   b) A body is subjected to the three forces as shown in Fig.2. If possible determine the direction of the force F so that the resultant is in x-direction., when (i) F= 5000N and (ii) F= 3000N.

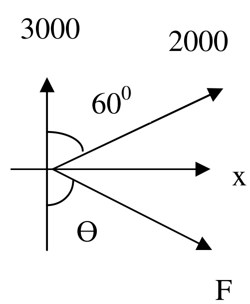


Figure 2
~~~~~~~~~~~~~~~~~~~~~~~

3. a) What are the differences between centroid and centre of gravity?
   b) Determine the centroid of composite section shown in Figure 3.

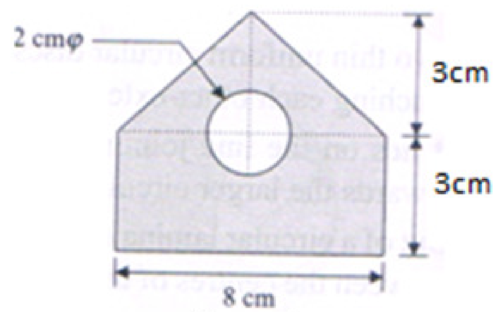


Figure 3

4. Calculate the moment of inertia of L section about an axis parallel to the base of the L and passing through its centre of gravity (refer Figure 4). Thickness of the section is 2cm. All dimensions are in cm.

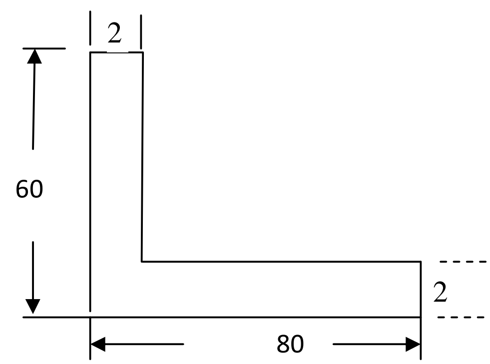


Figure 4

5. Determine the axial forces in all members of the frame in Fig.5 by the method of joints and tabulate the results

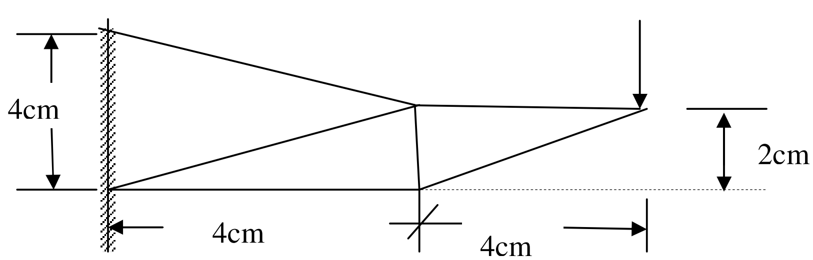


Figure 5

6. a) Distinguish between kinematics and kinetics.
   b) A body of 3kg mass is suspended by an inextensible string of length 1m. it is rotated in a circular path of 0.5 m radius. Determine the tension in the string and the constant speed of the body.

7. a) State the work – energy principle.
   b) In the world records, a man pulled a Boeing 747-400 weighing 187 tons, a distance of 91m in 1min 27.7sec. If the force of friction is 1kN/ton then determine the work done by the man and power exerted by him, if he maintained constant speed during this operation.

8. Derive an expression for the efficiency of a screw jack with square threads on its screw for lifting a load. Deduce the condition for maximum efficiency.

Code No: R21043 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTICS PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Distinguish between Joint probability and conditional probability.
   b) State and Prove the Baye's Theory.
   c) A box of 30 diodes is known to contain 5 defective ones. If two diodes are slaved at random without replacement, what is the probability that at least one of these diodes is defective?

2. a) Define the probability density function of random variable and state its properties
   b) Explain the Rayleigh distribution and density functions.

3. a) A random variable has pdf

$$f_y(x) = \frac{5}{4}(1-x^4) \qquad 0 \le x \le 1$$
$$= 0 \qquad \text{else where}$$

   Find E (4x+2) and E(x^2)

   b) Find the characteristic function of the random variable x having the density function.

$$f_x(x) = \frac{1}{2a} \quad |x| < a$$
$$= \ 0 \quad \text{other wise}$$

4. a) Determine the constant b such that the function

$$f_{XY}(x, y) = 3xy \qquad 0 < x < 1, \quad 0 < y < b$$
$$= 0 \qquad \text{other wise}$$

   is a valid joint density function

   b) Find the density of w=x+y where the densities of x and y are assumed to be

$$f_X(x) = [u(x) - u(x-1)]$$
$$f_Y(y) = [u(y) - u(y-1)]$$
~~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Random variable X and Y have the joint density.

$$f_{xy}(x,y)=\frac{1}{24} \qquad 0<x<6, \quad 0<y<4$$
$$=0 \qquad else\ where$$

What is the expected value of the functions g (x,y) = $(xy)^2$

b) Random variable x_1 and x_2 have the joint Characteristic function

$$\phi\, x_1,x_2(w_1,w_2)=\left[(1-j2w_1)(1-j2w_2)\right]^{-N/2}$$

Where N>0 is an integer

Find the correlation and moment's m_{20} and m_{02}

6. a) Explain the following: i) concept of Stationarity ii) Ergodic Random processes.

b) State and prove the properties of Auto correlation function.

7. a) If the Auto Correlation of random binary transmission process is given by

$$R(\tau)=\begin{cases}1-\frac{|\tau|}{T} & |\tau|\le T\\ 0 & \text{else where}\end{cases}$$

Find the power spectral density of process

b) Write short notes on "power density spectrum".

8. a) A random noise x(t) having the power spectrum $S_{XX}(w)=\frac{3}{49+w^2}$ is applied to a network for which h(t)=u(t) t^2 exp(-7t). The network response is denoted by y(t)

i) What is the average power in x(t)

ii) Find the power spectrum of x (t)

iii) Find the average power of y (t)

b) Write short notes on "Arbitrary Noise Sources".

Code No: R21043 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTICS PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain the following in brief
   i) Probability as a relative frequency ii) Joint provability
   iii) Baye's theorem iv) Independent events

   b) A multi channel microwave link is to provide te1ephone communication to a remote community having 12 subscribes, each of whom uses the link 20% of time during peak hours. How many channels are needed to make the line available during peak hours to
   i) Eighty percent of the subscribes all of the time
   ii) All of the subscribes 80% of the time
   iii) All of the subscribes 95% of the time

2. a) Find the value of the constant K so that

$$f_x(x) = \begin{cases} Kx^2(1-x^3) & 0 \le x \le 1 \\ 0 & \text{other wise} \end{cases}$$

   Is this a proper density function of a continuous random variable.
   b) Explain about the Gaussian distribution and density function.

3. a) Find the moment generating function about the origin of the Poisson distribution.
   b) Show that any characteristic function q_x (w) satisfies
   $|q_x(w)| \le q_x(0) = 1$

4. a) Let X and Y be jointly continuous random variables with joint pdfs

$$fXY(x, y) = x^2 + \frac{xy}{3} \; for\ 0 \le x \le 1, \quad 0 \le y \le z$$
$$= 0 \qquad other\ wise$$

   i) Are x and y independent
   ii) Check f(x/y) and f(y/x) are pdfs or not

   b) State and prove the centered limit theorem.
~~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) A joint density is given as

$$f_{XY}(x, y) = \begin{cases} x(y+1.5) & 0 < x < 1 \; and \\ 0 & other\ wise \end{cases}$$

Find all the joint moments m_{nk}. n and k=0,1,………

b) Let x be random variable with E(x)=2 and var (x)=3 verify that random variable x and the random variable y=-4x+8 are orthogonal.

6. a) Consider a random process x(t)=A cos (ωt+θ) where w and θ are constants and A is a random variable with zero mean and variance σ_A^2. Determine whether x(t) is a wide sense stationary process or not

b) Distinguish between Auto correlation function and cross correlation function. State the properties of cross correlation function.

7. a) A stationary random process has an auto correlation function of

$$R_x(\tau) = 16 - e^{-5|\tau|} \; cos\ 20\pi\tau + 8\ cos 10\pi\tau.$$

i) Find the variance of this process

ii) Find the spectral density of this process

b) Prove that the power spectrum and Autocorrelation function of the random process form a Fourier Transform pair.

8. Write short notes as: i) Thermal Noise ii) Properties of band limited processes

Code No: R21043 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTICS PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain the following
   i) Axioms of probability ii) Independent events iii) Total probability

   b) A and B are events such that $p(A \cup B) = \frac{3}{4}$ $p(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{2}{3}$ find $p(\overline{A}/B)$

   c) In a group of external number of men and women 10% men and 45% women are unemployed. What is the probability that a person selected at random is employed?

2. a) If the communicative distribution function of a random variable x is given by

$$f_X(x) = \begin{cases} 1 - \frac{4}{x^2} & x \geq 2 \\ 0 & x \leq 2 \end{cases}$$

   Find i) p(x<3) ii) p(4<x<5) iii) $p(x \geq 3)$

   b) Explain about Poisson distribution and density functions.

3. a) Let x be a random variable with distribution f_x given by

$$f_X(x) = \begin{cases} 1 - e^{-\lambda x} & 0 \leq x \leq \infty \\ 0 & other\ wise \end{cases}$$

   Find the pdf of x. Determine the mean and variance of the distribution.

   b) Find the moment generating function (MGF) for the distribution $f_x(x) = \frac{1}{2^x}$ x=1,2,3……..
   Also find its mean.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The pdf is given by

$$f_{XY}(x, y) = \frac{6}{5}(x + y^2) \quad 0 \le x \le 1, \quad 0 \le y \le 1$$
$$= \quad 0 \qquad \text{other wise}$$

i) Find the marginal pdf of x and that of y

ii) Find $p\left[\frac{1}{4} \le y \le \frac{3}{4}\right]$

b) Explain about conditional distribution and density internal conditioning.

5. a) Let(x,y) be two dimensional random variable described by joint pdf.

$$f_{XY}(x, y) = 8xy \quad 0 \le x \le 1, \quad 0 \le y \le x$$
$$= 0 \qquad \text{else where}$$

Find the cov(x,y)

b) Explain about "jointly Gaussian random variables"

6. a) Discus the stationarity of the random process $x(t) = A\cos(\omega_0 t + \theta)$ where A and ω_0 are constants and θ is a uniformity distributed random variable in $(0,2\pi)$

b) Consider two random processes x(t)=3 cos (wt+θ) and y(t)=2 cos(wt+θ-$\pi/2$) where θ a random variable distributed in $(0,2\pi)$

prove that $\left|R_{xy}(\tau)\right| \le \sqrt{R_{xx}(0)\,R_{yy}(0)}$

7. a) The psd of a random process is given by

$$S_{xx}(w) = \begin{cases} \pi & |w| < 1 \\ 0 & \text{else where} \end{cases}$$

Find its Auto correlation function

b) What is cross power density spectrum? State its properties

8. a) Find the output power density spectrum and output Auto correlation function for a system with

$$h(t) = e^{-t} \quad t \ge 0 \text{ for as input with psd} = \frac{ho}{2} \qquad -\infty < t < \infty$$

b) Write short notes on "effective noise temperature".

II B. Tech I Semester, Regular Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTICS PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Define the following and give are example for each of the following
   i) Discrete and continuous sample space
   ii) Mutually Exclusive event
   iii) Equally likely event
   b) A letter is known to have come either from LONDON or CLIFTON. On the post card only two consecutive letters as 'ON' are legible what is the chance that it came from LONDON.
   c) What is the probability that a randomly selected integer chosen from the first 100 positive integers is odd?

2. a) The distribution for x is defined by $f_X(x) = \begin{cases} 0 & \text{for } x < 0 \\ 1 - \frac{1}{4} e^{-x} & \text{for } x \geq 0 \end{cases}$

   Determine p(x=0) and p(x>0)

   b) Explain about "Binominal distribution and density functions"

3. a) A continuous distribution is given by

   $$fx(x) = \frac{1}{x\sqrt{2\pi}} e^{-(\log x)^2} \quad x \geq 0$$
   $$= 0 \qquad elsewhere$$

   Find the mean, standard deviation, coefficient of skewness of this distribution

   b) The characteristic function for a Gaussian random variable x, having R mean value of zero is $q_X(w) = \exp\left|- j\sigma^2 w^2 / 2\right|)$. Find all the moments of x using $q_X(w)$
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The joint pdt of the two dimensional r.v(x,y) is given by

$$fxy(x,y) = \frac{1}{4} e^{|x| - |y|} \quad \begin{array}{l} -\infty < x < \infty \\ -\infty < y < \infty \end{array}$$
$$= 0 \qquad else\ where$$

i) Check whether x and y are independent
ii) p(x≤1, y≤0)

b) The probability density function of two statistically independent random variables X and Y are

$$fx(x) = \begin{cases} \frac{3}{32}\ (4 - x^2) & -2 \le x \le 2 \\ = 0 & else\ where\ in\ x \end{cases}$$

$$fy(y) = \frac{1}{2}[x(y+1) - u(y-1)]$$

Find the exact probability density of the sum w=x+y

5. a) Two random variable have a uniform density on a circular region defined by

$$fxy(x,y) = \frac{1}{\pi r^2} \quad x^2 + y^2 \le r^2$$
$$= 0 \qquad else\ where$$

Find the mean value of the function $g(x,y)=x^2+y^2$

b) Two random variables x and y have the joint characteristic function

$$q_{xy}(w_1, w_2) = \exp\left(-2w_1^2 - 8w_2^2\right)$$

Show that i) x and y are both zero mean random variable ii) x and y are uncorrelated

6. a) Explain the following w.r.to Random processes
i) Strict sense stationary ii) Mean Ergodic processes.
b) Explain about Poisson Random processes

7. a) For a random process x(t), assume that $Rxx(\tau) = \rho\ e^{-\tau^2/2a^2}$ where ρ>0 and a>0 are constants. Find the power density spectrum of x(t)
b) Prove that the cross power spectrum and cross correlation function of Random process form a Fourier transform pair.

8. a) Define a given system and derive a relation between the input and output spectra of the system.
b) Explain "Resistive noise" in detail.

Code No: R21053 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Construct the truth tables of the following formulas
   i) $(Q \wedge (P \rightarrow Q)) \rightarrow P$
   ii) $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$
   b) Show the following implication without constructing the truth table.
   $(P \rightarrow Q) \rightarrow Q \Rightarrow P \vee Q$
   c) Prove that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x) P(x) \wedge (\exists x) Q(x)$ (7M+4M+4M)

2. a) What is the property of GCD(a, b) used by Euclid's algorithm? Write and explain the algorithm with example.
   b) What is modular arithmetic? How the basic operations are defined? (8M+7M)

3. a) Define the following and give examples:
   i) inverse function
   ii) One-to-one function
   iii) Onto function
   iv) bijective function
   b) Let P(A) be the power set of any non empty set A, then prove that the relation $\subseteq$ of set inclusion is not an equivalence relation. (8M+7M)

4. a) Find the number of edges in a 4-regular graph of order 3.
   b) Is the degree sequence (1, 2, 3, 3, 3, 5, 5) a graphic? If so, draw the graph for the same
   c) How many vertices will the graph have if it contains 21 edges, 3 vertices of degree 4, and the other vertices of degree 3. (5M+5M+5M)
~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain Kruskal's algorithm with example.
   b) Discuss the following with suitable example
      i) Graph coloring
      ii) planar graph (8M+7M)

6. a) Prove that if a, b $\in$ R where $\langle R, +, \cdot\rangle$ is a ring, then $(a + b)^2 = a^2 + a \cdot b + b \cdot a + b^2$ where $a^2 = a \cdot a$.
   b) If H = { 1, -1 } and G = { 1, -1, i, - i } , then find the right cosets of H in G. (8M+7M)

7. a) Find the coefficient of x^{10} in
      i) $(1 + x + x^2 + \ldots)^2$
      ii) $\frac{1}{(1-x)^3}$
   b) How many ways are there to seat 10 boys and 10 girls around a circular table, if boys and girls seat alternatively.
   c) Find the number of arrangements of the letters of TENNESSEE. (7M+4M+4M)

8. a) Solve the Fibonacci relation $a_n = a_{n-1} + a_{n-2}$ with $a_0 = 0$ and $a_1 = 1$ as initial conditions.
   b) Solve the recurrence relation $a_n = a_{n-1} + n^2$ where $a_0 = 7$ by substitution method. (8M+7M)

Code No: R21053 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Show that the truth values of the following are independent of their components.

   $(P \rightarrow Q) \leftrightarrow (\neg P \vee Q)$

   b) Write down the symbolic form of the following statement and write its negation.

   If k, m, n are any integers where k - m and m – n are odd, then k – n is even.

   c) Verify the validity of the following argument.

   All boys are players. Sachin is a boy. Therefore Sachin is a player.

   d) Determine the validity of the following argument.

   If two sides of a triangle are equal, then two opposite angles are equal. Two sides of a triangle are not equal. Therefore, the opposite angles are not equal. (3M+4M+4M+4M)

2. a) Compute the inverse of each element in Z_7 using Fermat's theorem.

   b) State and explain the division theorem. (8M+7M)

3. a) Let f: A → R be defined by f(x) = (x-2) / (x-3), where A = R – {3}. Is the function f bijective? Find f^{-1}.

   b) (i) What is relation? Give properties of binary relation.

   (ii) Describe about permutation functions and recursive function with examples.

   (8M+7M)

4. a) Define the following terms and give an example of each.

   i) Complement graph ii) Complete graph

   iii) Isomorphic graphs iv) Hamiltonian graph

   b) Find the number of vertices in a graph containing 3 vertices of degree 4, 2 vertices of degree 3 and remaining vertices of degree 2. Given that number of edges in G is 11.

   c) Is the degree sequence (2, 2, 3, 3, 4) a graphic? If so, draw the graph for the same.

   (7M+4M+4M)
~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain Prim's algorithm with example.
   b) Use Euler's formula to show that the graph $K_{3,3}$ is non-planar. (8M+7M)

6. a) If for a group G, f: G → G is given by $f(x) = x^2$ for all $x \in G$ is a homomorphism, prove that G is Abelian.
   b) Let G be a multiplicative group and f: G → G, such that for $a \in G$, $f(a) = a^{-1}$. Prove that f is one-to-one, onto. (8M+7M)

7. a) Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7. Also indicate how many are divisible by 3 or 7 but not by 5.
   b) An identifier in a programming language consists of a letter followed by alphanumeric characters. Find the number of legal identifiers of length at most 10. (8M+7M)

8. a) Solve the recurrence relation $a_n - 4\, a_{n-1} + 3\, a_{n-2} = 0$ for n >= 2 with initial conditions $a_0 = 2$ and $a_1 = 4$ by using generating functions.
   b) What does the recurrence relation: $T(0) = 1, T(n) = T(n-1) + 3^n$ evaluates to? (8M+7M)

Code No: R21053 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Are $(P \rightarrow Q) \rightarrow R$ and $P \rightarrow (Q \rightarrow R)$ logically equivalent? Justify your answer by using the rules of logic to simplify both expressions and also by using truth tables.
   b) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ and Q, using rule CP. (8M+7M)

2. a) Compute the inverse of each element of Z_{12}, if it exists, using Euler's theorem.
   b) State and prove Fermat's theorem. (8M+7M)

3. a) If f: R → R, g: R → R, where R is the set of real numbers. Find f **o** g, g **o** f where $f(x) = x^2 - 2$, $g(x) = x + 4$. State whether these functions are injective, subjective or bijective.
   b) Let $(L, \leq)$ be a lattice and a, b, c ∈ L, Show that the following are equivalent
      i) $a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c)$
      ii) $a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$ (8M+7M)

4. a) List and explain different representations of graphs. Illustrate with an example for each.
   b) Suppose G is a connected planar graph with 14 regions each of degree 4. Find the number of vertices in G.
   c) Is there a simple graph with degree sequence (1, 1, 3, 3, 3, 4, 6, 7)? (7M+4M+4M)

5. a) What are the steps involved in graph traversal using Breadth-First Search algorithm? Illustrate with an example.
   b) What is the chromatic number of a cycle graph and a complete graph of n vertices? (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~

6. a) Show that the set N of natural numbers is a semi group under the operation $x * y = \max\{x, y\}$. Is it a monoid?

   b) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a * b = ab/4$. (8M+7M)

7. a) In a survey of students at Florida University, the following information was obtained. 260 were taking a statistics course, 208 were taking a Mathematics course, 160 were taking a Computer programming course, 76 were taking statistics and Mathematics, 48 were taking Statistics and Computer programming, 62 were taking Mathematics and Computer programming, 32 were taking all 3 kinds of courses and 150 none of the 3 courses.

   i) How many students were surveyed?

   ii) How many were taking Statistics and Mathematics but not Computer programming?

   iii) How many were taking Computer programming but not taking Mathematics or Statistics?

   iv) How many were taking a Mathematics but not taking Statistics or Computer programming?

   b) Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + \dots)^5$ (8M+7M)

8. a) Solve $a_n + 7a_{n-1} + 10\,a_{n-2} = 0$, $n >= 2$ with $a_0 = 10$, $a_1 = 41$.

   b) Solve the Recurrence relation by using substitution method

   $a_n = a_{n-1} + n$ where $a_0 = 2$ (8M+7M)

Code No: R21053 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Show that the truth values of the following formula is independent of their components.
   $(P \leftrightarrow Q) \leftrightarrow ((P \wedge Q) \vee (\neg P \wedge \neg Q))$
   b) Show the following formula is a tautology without constructing truth table.
   $(P \wedge (P \rightarrow Q)) \rightarrow Q$
   c) Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$
   d) Test whether the following is a valid argument.
   If Sachin hits a century, then he gets a free car. Sachin does not get a free car. Therefore, Sachin has not hit a century. (3M+4M+4M+4M)

2. a) What is the principle of mathematical induction? Explain with example.
   b) State the following theorems
      i) The fundamental theorem of arithmetic
      ii) Division theorem
      iii) Fermat's theorem
      iv) Euler's theorem. (8M+7M)

3. a) Let $(L, \leq)$ be a lattice and $a, b, c \in L$. Then prove the following
      i) $a \vee b = b$ iff $a \leq b$
      ii) $a \wedge b = a$ iff $a \leq b$
   b) Draw a poset diagram representing the positive divisors of 36 and determine all maximal, minimal, elements and greatest, least elements if they exist.
   c) Let X = { 1, 2, 3, 4 } and R = { (1, 2), (2, 3), (3, 4) } be a relation on X. Find R^+.
   (7M+4M+4M)

4. a) Define the following terms. Give one suitable example for each.
      i) Euler path ii) Euler circuit
      iii) Hamiltonian graph iv) Isomorphic graphs
   b) When it can be said that two graphs G_1 and G_2 are isomorphic? How can it be discovered? Explain with example. (8M+7M)

5. a) Define tree. Explain in detail about properties of spanning tree.
   b) Find whether K_5 is planar or not. (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~~~

6. a) List and explain the properties of an algebraic system.
   b) Let Z be the set of integers. o is an operation in Z defined by a **o** b = a + b +1.
   Prove that (Z, **o**) is a semi-group. (8M+7M)

7. a) In a language survey of students, it is found that 80 students know English, 60 know French, 50 know German, 30 know English and French, 20 know French and German, 15 know English and German and 10 students know all the three languages. How many students know
      i) at least one language
      ii) English only
      iii) French and one but not both out of English and German
      iv) at least two languages.
   b) Prove that C(n+3, r) – 3C(n+2, r) + 3C(n+1, r) – C(n, r) = C(n, r-3) (8M+7M)

8. a) For $n \geq 2$ suppose that there are n people at a party and that each of those people shakes hands exactly one time with all the other people there and no one shakes hands with himself or herself. If a_n counts the total number of handshakes, frame a recurrence relation per a_n and solve it.
   b) Solve the recurrence relation $a_r = 2\, a_{r-1} + 1$ with $a_1 = 7$ for $r > 1$ by substitution method.
   (8M+7M)

Code No: X0225 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and prove Gauss's law as applied to an electric field and determine the field due to an infinite line charge.
   b) Show that the electric filed intensity at any point inside a hollow charged spherical conductor is zero.

2. a) In a certain region the potential is given by $V = x^2 + 5y^2 + 4z^2$. Find the electric field intensity at a point (1, -2, 3) m.
   b) Show that the torque on a physical dipole $\overline{P}$ in a uniform electric filed $\overline{E}$ is given by $\overline{P} \times \overline{E}$. Extend this result to a pure dipole.
   c) Explain behavior conductors in an electric field.

3. a) State and prove the conditions on the tangential and normal components of electric flux density and electric field intensity, at the boundary between the dielectrics.
   b) An aluminum conductor is 304.8m long and has a circular cross section with a diameter of 0.8 inches. If there is a dc voltage of 2.0V between the ends find (i) the current density (ii) the current (iii) the Power dissipated.

4. a) State and explain Biot-Savart's law and derive the expression for the magnetic field at a point due to an infinitely long conductor carrying current.
   b) A circuit is having a direct current of 5 amps form a regular hexagon inscribed in a circle of radius 1 m. Calculate the magnetic flux density at the center of the circular hexagon. Assume the medium to be free space.

5. a) What are the limitations of Ampere's current law? How this law can be modified to time varying field.
   b) A square loop 10 cm on a side has 500 turns that are closely and tightly wound and carries a current of 120 A. Determine the magnetic flux density at the centre of the loop.

6. a) What is a magnetic dipole? How does a magnetic dipole differ from an electric Dipole? Explain about magnetic dipole moment.
   b) Derive the expression for force between two long parallel current carrying conductors placed in a magnetic field.

7. a) Explain the concept of vector and scalar magnetic potentials.
   b) Derive the Neumann's formulae for the calculation of self and mutual inductances.

8. a) Explain about Poynting vector.
   b) Find the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^{-4}$ mho/m and $\epsilon_R = 81$.
~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0225 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and explain Coulomb's law to determine force between two point charges.
   b) Find the electric field intensity at a point P_1 (0, 1, 2) m due to charge Q_1=300 nC, located at P_2 (2, 0, 3) m in free space.

2. a) Discuss the behavior of conductors in an electric field.
   b) Develop an expression for potential difference at any point between two spherical shells in terms of the applied potential. Use Laplace equation.

3. a) Derive an expression for capacitance between two concentric spherical shells.
   b) Derive the expression for continuity equation.

4. a) Find the expression for the magnetic flux density, 'B' at a distance 'h' above the centre of a rectangular loop of wire 'b' meters on one side and 'a' meters on the other side. The loop carries a current of one ampere.
   b) A single turn circular coil of 50 m in diameter caries a current of $28\text{x}10^4$ amperes. Determine the magnetic field intensity H at a point on the axis of coil and 100 m from the coil. The μ_r of free space is unity.

5. a) Show that $\nabla \times \vec{H} = \vec{J}$.
   b) Find the vector magnetic field intensity H at a point P (2.5, 2, 3) m caused by a current filament of 12 A in $\hat{a}_z$ direction on the z-axis extending from 0 to 6.

6. a) Two conducting filaments extend along the 'x' and 'y' axes, carrying currents I_1 and I_2 in the a_x and a_y directions, respectively. Find the differential force exerted on the differential current element $I_2\, dl_2$ at (0,1,0) m by the differential element $I_1\, dl_1$ at (1,0,0) m.
   b) Derive the expression for torque exerted on a current-carrying loop placed in a magnetic field.

7. a) Derive the expression for magnetic vector potential?
   b) Explain about the Vector Poisson's equation for steady magnetic field.

8. a) Explain the concept of displacement current and obtain an expression for the displacement current density.
   b) Explain the terms: (i) Motional EMF (ii) Static EMF
~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0225 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A very thin, finite, and uniformly charged line of length 10m carries a charge of 10 μC/m. Calculate the electric field intensity in a plane bisecting the line at ρ = 5 m.
b) Determine the electric field intensity due to infinite line charge, at a point perpendicular to its plane and at a given distance from the line charge from first principles.

2. a) A uniform charge density of ρ_v C/m^2 exists throughout the volume of a sphere of radius '*b*' meters. Using Poisson's equation, find the value of electric filed intensity and potential at any point inside the sphere for which $0 \le r \le b$.
b) Derive Poisson's and Laplace equations starting from point form of Gauss Law.

3. a) Derive the point form of Ohm law for conductors.
b) Derive an expression for the capacity of a spherical capacitor consisting of two concentric spheres of radii a and b, the dielectric medium between the two spheres being air. Henceforth show that the same expression can be written as $C = \frac{\varepsilon_0}{d}\sqrt{A_a A_b}$, where A_a and A_b are the surface areas of the two spheres with radii a and b respectively.

4. a) Derive an expression for magnetic flux density at a point due to a current in a straight conductor of infinitely long straight conductor.
b) A long solenoid has a radius of 2 cm and a length of 1.2 m. If the number of turns per unit length is 200 and the current is 12 A, calculate the magnetic flux density i) at the Center and ii) at the ends of the solenoid.

5. a) Discuss the application of Amperes circuital law for unsymmetrical surfaces.
b) A circular loop located on $x^2 + y^2 = 9$, $z = 0$ carries a direct current of 10 A along a_φ direction. Determine H at (0, 0, 5) cm and (0, 0, -5) cm.

6. a) A point charge of value -40 nC is moving with a velocity of 6000 km/sec in a direction specified by the unit vector $\hat{a}_v = -0.48\hat{a}_x - 0.6\hat{a}_y + 0.64\hat{a}_z$. Using Lorentz's force equation, find the force $\overline{F}$ if (a) $\overline{B} = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ mT (b) $\overline{E} = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ kV/m.
b) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I_1 and I_2.

7. a) Explain the characteristics and applications of permanent magnets.
b) Derive the expression for inductance of a solenoid.

8. a) Show that power loss in a conductor is given as product of voltage and current using Poynting theorem.
b) Verify the fields $\vec{E} = E_m sin(\ x)\ sin(\ t)\ \hat{a}_y$ and $\vec{E} = \frac{E_m}{\mu_o} cos(\ x)\ cos(\ t)\ \hat{a}_z$ satisfy Maxwell's equations or not.
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0225 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Define electrostatic potential. Discuss the properties of electrical potential function.
   b) Three equal positive charges of 4 nC each are located at three corners of a square side 20 cm. Determine the magnitude and direction of the electric field at the variant corner of the square.

2. a) Derive an expression for torque due to a dipole that is present in an electric field.
   b) Measurement made in the atmosphere show that there is an electric field which varies widely from time to time particularly during thunderstorms. Its average values on the surface of earth at a height of 1550 m were found to be 100 V/m and 25 V/m directed downward towards the earth respectively. Calculate: i) the mean space charge in the atmosphere between 0 and 1500 m altitude ii) Surface charge density on the earth.

3. a) Two parallel conducting plates 5cm apart and situated in air are connected to a source of constant potential difference of 80kV. Find the electric field intensity between the plates if it is within permissible value? If a mica sheet (ε_r = 5) of thickness 2cm is introduced between the plates, determine the field intensity in air and mica.
   b) Derive an expression for Capacitance due to two concentric spherical conductors.

4. a) An air cored toroid having a cross sectional area of 6 cm^2 and mean radius 15 cm is wound uniformly with 500 turns. Determine the magnetic flux density and the field intensity.
   b) A conductor in the form of regular polygon of "n" sides, inscribed in a circle of radius "R". Show that the expression for magnetic flux density $B = \frac{\mu_0 nI}{2\pi R}\tan(\frac{\pi}{n})$ at the centre, where I is the current.

5. a) State and explain Ampere's circuital law and derive the same in point differential form.
   b) Find the magnetic field intensity at centre of a square of sides equal to 5 m and carrying a current equal to 10 A. Derive the formula used.

6. a) State and explain Lorentz's force equation?
   b) A single-phase circuit comprises two parallel conductors A and B, each 5 cm diameter and spaced 10 meter apart. The conductors carry currents of +50 and -50 amperes respectively. Determine the magnetic field intensity at the surface of each conductor and also exactly midway between A and B.

7. a) Obtain the expression for inductance of a toroid.
   b) Derive the expression for energy density in a magnetic field.

8. a) Starting from Faraday's law of electromagnetic induction, derive $\nabla \times E = -\frac{\partial \vec{B}}{\partial t}$.
   b) From the Maxwell's equations, derive the expression for Poynting vector. Also, explain the applications of the Poynting vector.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0323 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MECHANICS OF SOLIDS
(Com. to ME, MMT, AME, MM)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain in detail the behavior of mild steel when subjected to load test till failure.
   b) A 2.0 m long steel tie bar is subjected to a force of 150.0 kN. Determine its cross section so that i) the stress does not exceed 140.0 MPa ii) the extension is not more than 1.2 mm. Assume a Young's modulus of 210.0 GPa; steel bars are available in increments of 5 mm from 30 mm diameter onwards.

2. a) The following Figure.1 indicates the Shear Force diagram. Develop the loading and Bending Moment diagram for the beam.

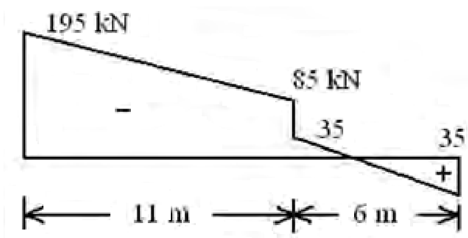


Figure.1

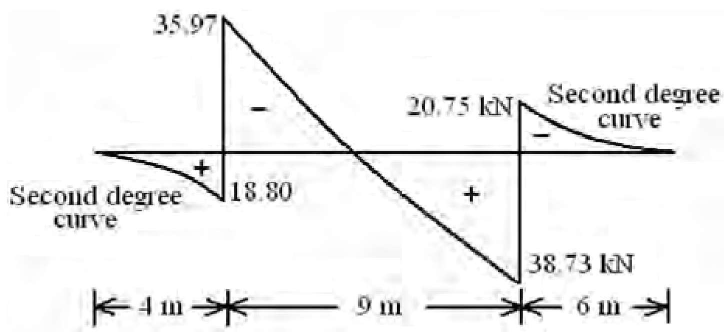


Figure.2

   b) The following Figure.2 indicates the Shear Force diagram. Develop the loading and Bending Moment diagram for the beam.

3. a) State the assumptions involved in the theory of simple bending.
   b) A simply supported Symmetric I - section has flanges of size 200mm X15mmand its overall depth is 520mm. Thickness of web is 10mm. It is strengthened with a plate of size 250mm X 12mm on compression side. Find the moment of resistance of the section if permissible stress is 160MPa. How much uniformly distributed load it can carry if it is used as a cantilever of span 3.6m.

4. A rectangular beam of width b meters and height h meters carries a central concentrated load P on a simply supported span of length L meters. Express the maximum τ in terms of maximum σ_f.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. Analyze the truss indicated in Figure 3 using tension coefficient method.

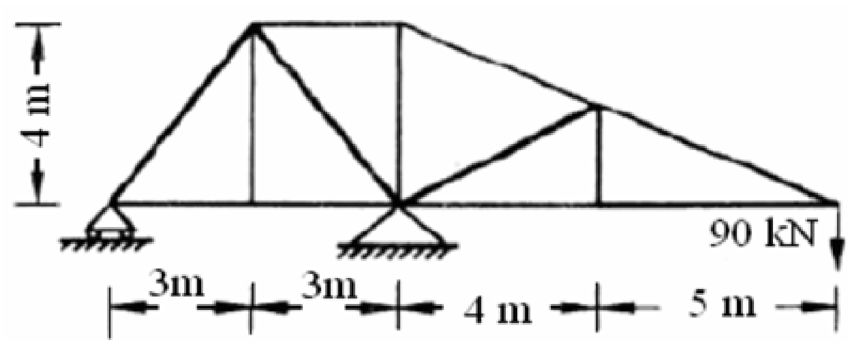
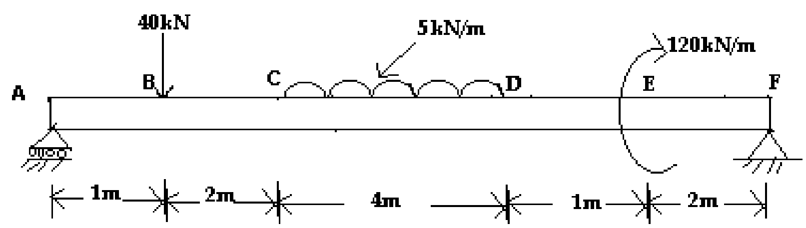


Figure.3

6. A beam as shown in fig below is simply supported at A and F. AB=1m, BC = 2m, CD = 4m, DE=1m, EF=2m. Concentrated load of 40KN at B, udl of 5 KN/m over CD and a clockwise moment 120 KN.m at E are applied. Determine the slope at F and deflection at B and midpoint of beam



7. a) Derive the expressions for longitudinal and hoop stress in a thin cylinder subjected to fluid pressure internally.
   b) A cylindrical shell, 3m long, 1000mm in diameter, thickness of metal 12mm is subjected to an internal pressure of 1.5 N/mm^2. Calculate the maximum intensity of shear stress induced and also the changes in the dimensions of the shell. Given E = 2x1.5 N/mm^2 and 1/m = 0.3.

8. A thick steel cylinder of 1000 mm inside diameter is to be designed for an internal pressure of 4.8 MN/m^2. Calculate:
   i) The thickness if the maximum shearing stress is not to exceed 21 MN/m^2.
   ii) The increase in volume due to working pressure, if the cylinder is 7m long with closed ends.

   Neglect any constraints due to ends
   Take: E = 200 GN/m^2. Poisson's ratio: 1/3.

Code No: X0323 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MECHANICS OF SOLIDS
(Com. to ME, MMT, AME, MM)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Define necking of a tensile test specimen, and explain the characteristics of materials in which it occurs.
   b) A 12.5 m long steel rope supports a mass of 1000.0 kg. Design the rope comprising 1.6 mm strands with a yield stress of 1500.0 MPa and Young's modulus of 175.0 GPa. Assume a safety factor of 3.5; the elongation of the rope should not exceed 12.5 mm.

2. a) Develop Bending moment and Shear force for the Figure.1 given below indicating the maximum and minimum values.

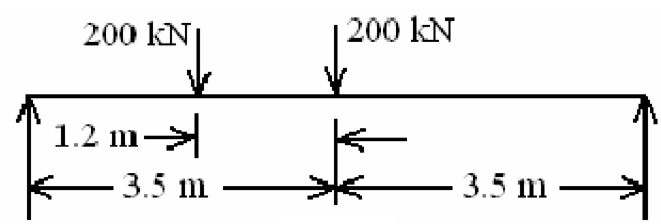


Figure. 1

   b) Develop Bending moment and Shear force for the Figure.2 given below indicating the maximum and minimum values.

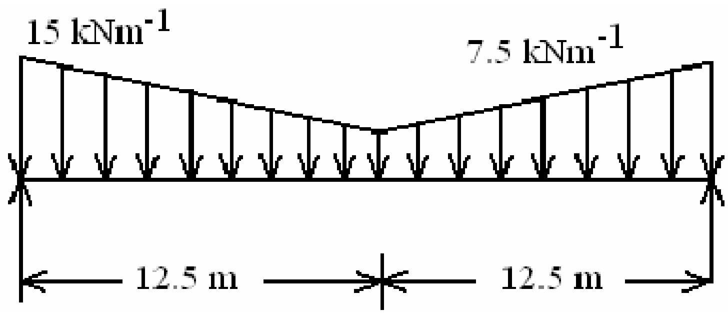


Figure. 2

3. A high-strength steel band saw, 20 mm wide by 0.80 mm thick, runs over pulleys 600 mm in diameter. What maximum flexural stress is developed? What minimum diameter pulleys can be used without exceeding a flexural stress of 400 MPa? Assume E = 200 GPa.
~~~~~~~~~~~~~~~~~~~~~~~~~

4. Assume the cross section of a beam is isosoceless triangle. The horizontal base is 11 cm and the height is 16 cm, plot the distribution of shear stress in the section if the shear force at the section is 15kN.

5. Analyze the truss indicated in the Figure.4 by method of joints.

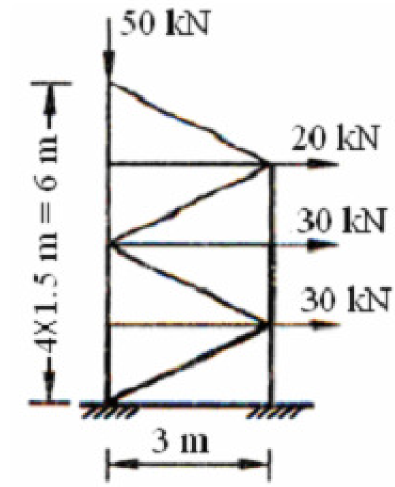


Figure.4

6. A 2 meters long cantilever of rectangular section 100 mm wide and 200 mm deep carries a uniformly distributed load of 2.5 KN/m for a length of 1.25 m from the fixed end and a point load of 1 KN at the free end. Find the deflection at the free end. Take E = 10 GN/m^2.

7. A cast iron pipe of 250.0 mm diameter and 6 mm thickness carrying water at a head of 36.0 m is supported at 6.3 m spacing. Determine the principal stresses and the maximum shear stress in the pipeline.

8. A compound cylinder comprises an inner tube of diameters 250.0 mm and 350.0mm, and an outer tube of diameters 350.0 mm and 450.0 mm. determine the diametral interference required so that the final maximum stress in the tube does not exceed 120.0 MPa under an internal pressure of 73.0 MPa. Neglect the effects of longitudinal stresses. Assume E = 180.0 GPa.

Code No: X0323 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MECHANICS OF SOLIDS
(Com. to ME, MMT, AME, MM)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A Steel bar is placed between two copper bars each having the same area and length as the steel bar at 15°C. At this stage they are rigidly connected together at both the ends. When the temperature is raised to 315°C, the length of the bars increases by 1.50mm? Determine the original length and final stresses in the bars. Take $E_s=2.1 \times 10^5$ N/mm^2. $E_c=1 \times 10^5$ N/mm^2, $\alpha_s=0.000012$/°C, $\alpha_c=0.0000175$/°C.

   b) A hollow steel tube is to be used to carry an axial compressive load of 140KN. The yield stress for steel is 250N/mm^2.A factor of safety of 1.75 is to be used in the design. The following three classes of tubes of external diameter 101.6mm are available

Class	Thickness
Light	3.65mm
Medium	4.05mm
Heavy	4.85mm

   Which section do you recommend?

2. a) Define the terms 'Shear Force' and 'Bending Moment'.
   b) Draw shear force and bending moment diagrams for the beam shown in Fig.1

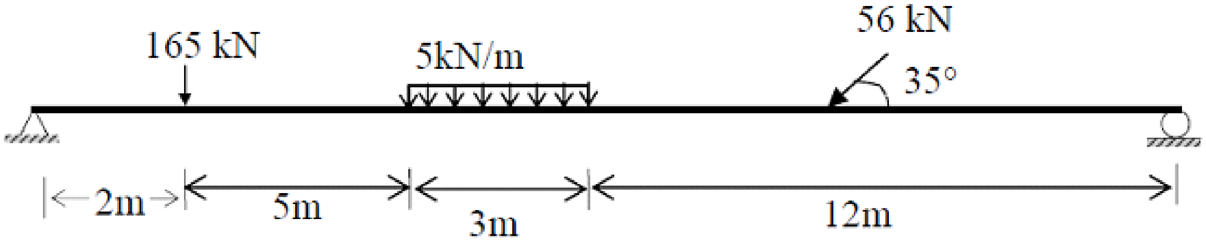


Figure.1

3. Determine the minimum width b of the beam shown in Figure.2 if the flexural stress is not to exceed 10 MPa.

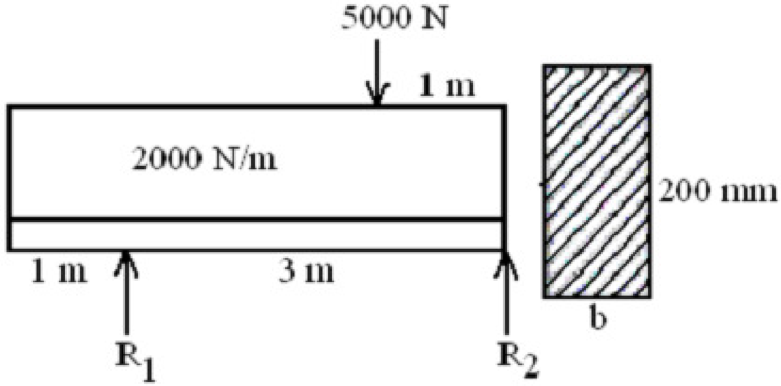


Figure.2
~~~~~~~~~~~~~~~~~~~~~~~~~

4. Compute the maximum force a 200.0 mm long compound bar comprising a copper rod of 18.0 mm diameter enclosed in a mild steel tube of 20.0 mm inner and 32.0 mm outer diameters can sustain. Assume Young's modulii for copper and steel to be 120.0 GPa and 195.0 GPa, respectively. What will be the reduction in the maximum load, if the bar temperature rises by 40.0 K? Find the reduction in strength when the temperature falls by 40.0 K. Allowable stresses are 80.0 MPa and 140.0 MPa in copper and steel, respectively; $\alpha = 18.0 \times 10^{-6}\ K^{-1}$ for copper and $12.0 \times 10^{-6}\ K^{-1}$ for steel.

5. Analyse the frame shown in Figure.3

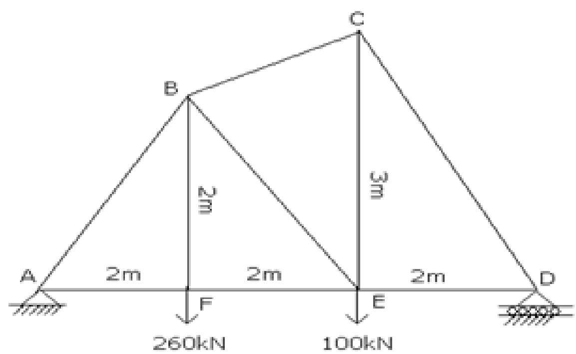


Figure.3

6. Determine the maximum deflection δ in a simply supported beam of length L carrying a concentrated load of 5P at mid span.
b) Determine the maximum deflection δ in a simply supported beam of length L carrying a uniformly distributed load from center of the beam to left hand support.

7. The outer diameter of a cylinder is 1.4 times its inner diameter. Assuming ν = 0.30, determine the ratio of external and internal pressures applied separately, so that in both the cases
   a) The largest stresses have the same numerical values and
   b) The largest strains have the same numerical values.

8. Design a cylinder of 1.8 m diameter to sustain an internal pressure of 35.0 MPa assuming a permissible stress of 230.0 MPa and Poisson’s ratio of 0.25. Apply thick cylinder theory.

Code No: X0323 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MECHANICS OF SOLIDS
(Com. to ME, MMT, AME, MM)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. A solid conical bar tapers uniformly from a diameter of 6cm to 2cm in a length of 100 cm. It is suspended vertically at the 6cm diameter, the 2 cm diameter end being downward. Calculate the elongation of the bar due to self-weight. Take unit weight of the bar material as 78.5 kN/m^3 and E = 204 kN/mm2**.**

2. For the beam AC as shown in the Figure.1, determine the magnitude of the load P acting at 'C'. Such that the reactions at A and B are equal. Draw shear force and bending moment diagrams for the beam. Mark the salient points and their values on the diagram. Locate the point of contraflexure, if any.

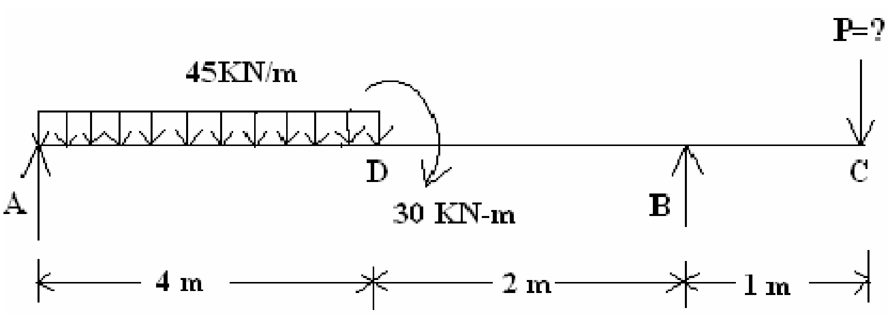


Figure.1

3. An I-Section beam as shown in Figure.2 has 200mm wide flanges and an overall depth 500mm. Each flange is 25mm thick and the web is 20mm thick. At a certain section bending moment is M. i) Find what percentage of "M" resisted by flanges and web.
ii) What percentage of shear is resisted by web?

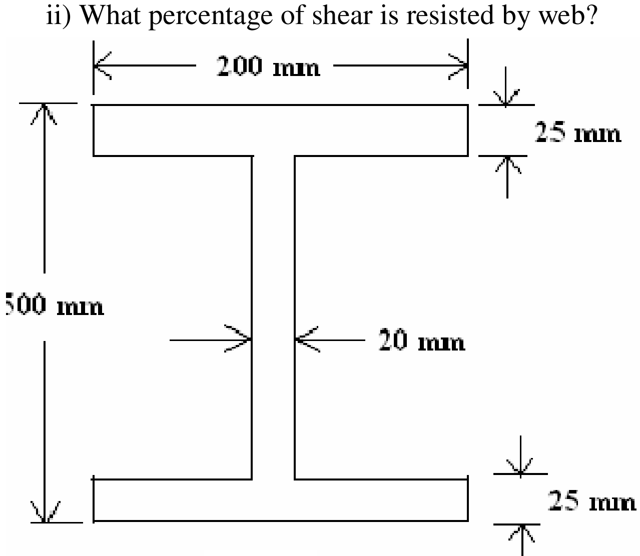


Figure.2
~~~~~~~~~~~~~~~~~~~~~~~~~

4. An I-section having flanges 200 mm × 20 mm and web 400 mm × 15 mm is used as a beam. If at a section, it is subjected to a shear force of 150 KN, find the greatest intensity of shear stress in the beam and show also the variation of shear stress across the section.

5. For the truss shown in figure.3 below, find the forces in the members.

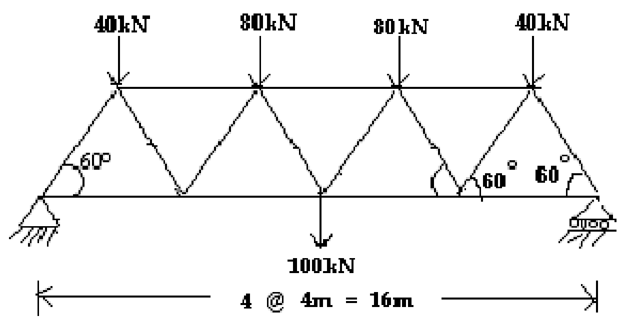


Figure.3

6. A simply supported beam A B of span 6 meters and of exural rigidity EI = $8X10^4$kN - m^2 is subjected to a clockwise couple of 60 kN-m at a distance of 4 m from the left end. Find the deflection at the point of application of the couple and the maximum deflection and slope.

7. What is the minimum (D/t) ratio for a cylinder to be considered thin? The required accuracy of stresses is a) 10 percent b) 5 percent c) 1 percent.

8. a) Derive an expression for the proportional increase in capacity of a thin cylindrical shell when it is subjected to an internal pressure.
   b) A vertical gas storage tank is made of 25 mm thick mild steel plate and has to withstand maximum internal pressure of 1.5 MN/m^2. Determine the diameter of the tank if stress is 240 MN/m2, factor of safety is 4 and joint efficiency is 80%.

Code No: X0421 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Com. to ECE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Distinguish between Joint probability and conditional probability.
   b) State and Prove the Baye's Theory
   c) A box of 30 diodes is known to contain 5 defective ones. If two diodes are slaved at random without replacement, what is the probability that at least one of these diodes is defective?

2. a) Define the probability density function of random variable and state its properties
   b) Explain the Rayleigh distribution and density functions.

3. a) A random variable has pdf

$$f_y(x) = \frac{5}{4}(1 - x^4) \qquad 0 \le x \le 1$$
$$= 0 \qquad \text{else where}$$

   Find E (4x+2) and E(x^2)

   b) Find the characteristic function of the random variable x having the density function.

$$f_x(x) = \frac{1}{2a} \; |x| < a$$
$$= 0 \quad \text{other wise}$$

4. a) Determine the constant b such that the function

$$f_{XY}(x, y) = 3xy \qquad 0 < x < 1, \quad 0 < y < b$$
$$= 0 \qquad \text{other wise}$$

   is a valid joint density function

   b) Find the density of w=x+y where the densities of x and y are assumed to be

$$f_X(x) = [u(x) - u(x-1)]$$
$$f_Y(y) = [u(y) - u(y-1)]$$
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Random variable X and Y have the joint density.

$$f_{xy}(x, y) = \frac{1}{24} \qquad 0 < x < 6, \quad 0 < y < 4$$
$$= 0 \qquad \textit{else where}$$

What is the expected value of the functions g (x,y) = $(xy)^2$

b) Random variable x_1 and x_2 have the joint Characteristic function

$$\phi\, x_1, x_2(w_1, w_2) = \left[(1 - j2w_1)(1 - j2w_2)\right]^{-N/2}$$

Where N>0 is an integer

Find the correlation and moment's m_{20} and m_{02}

6. a) Explain the following: i) concept of Stationarity ii) Ergodic Random processes.

b) State and prove the properties of Auto correlation function.

7. a) If the Auto Correlation of random binary transmission process is given by

$$R(\tau) = \begin{cases} 1 - \frac{|\tau|}{T} & |\tau| \le T \\ 0 & \text{else where} \end{cases}$$

Find the power spectral density of process

b) Write short notes on "power density spectrum".

8. a) A random noise x(t) having the power spectrum $S_{XX}(w) = \frac{3}{49 + w^2}$ is applied to a network for which h(t)=u(t) t^2 exp(-7t). The network response is denoted by y(t)

i) What is the average power in x(t)

ii) Find the power spectrum of x (t)

iii) Find the average power of y (t)

b) Write short notes on "Arbitrary Noise Sources".

Code No: X0421 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Com. to ECE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain the following in brief
   i) Probability as a relative frequency
   ii) Joint provability
   iii) Baye's theorem
   iv) Independent events

   b) A multi channel microwave link is to provide te1ephone communication to a remote community having 12 subscribes, each of whom uses the link 20% of time during peak hours. How many channels are needed to make the line available during peak hours to
   i) Eighty percent of the subscribes all of the time
   ii) All of the subscribes 80% of the time
   iii) All of the subscribes 95% of the time

2. a) Find the value of the constant K so that

$$f_x(x) = \begin{cases} Kx^2(1-x^3) & 0 \le \text{x} \le 1 \\ 0 & \text{other wise} \end{cases}$$

   Is this a proper density function of a continuous random variable.
   b) Explain about the Gaussian distribution and density function.

3. a) Find the moment generating function about the origin of the Poisson distribution.
   b) Show that any characteristic function q_x (w) satisfies
   $|q_x(w)| \le \text{q}_\text{x}(0) = 1$

4. a) Let X and Y be jointly continuous random variables with joint pdfs

$$fXY(x,y) = x^2 + \frac{xy}{3} \quad for\, 0 \le x \le 1, \quad 0 \le y \le z$$
$$= 0 \qquad other\ wise$$

   i) Are x and y independent
   ii) Check f(x/y) and f(y/x) are pdfs or not

   b) State and prove the centered limit theorem.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) A joint density is given as

$$f_{XY}(x, y) = \begin{cases} x(y+1.5) & 0 < x < 1 \text{ and} \\ 0 & \text{other wise} \end{cases}$$

Find all the joint moments m_{nk}. n and k=0,1,………

b) Let x be random variable with E(x)=2 and var (x)=3 verify that random variable x and the random variable y=-4x+8 are orthogonal.

6. a) Consider a random process x(t)=A cos (ωt+θ) where w and θ are constants and A is a random variable with zero mean and variance σ_A^2. Determine whether x(t) is a wide sense stationary process or not

b) Distinguish between Auto correlation function and cross correlation function. State the properties of cross correlation function.

7. a) A stationarity random process has an auto correlation function of

$R_x(\tau) = 16 - e^{-5|\tau|} \cos 20\pi\tau + 8\cos 10\pi\tau.$

i) Find the variance of this process

ii) Find the spectral density of this process

b) Prove that the power spectrum and Autocorrelation function of the random process form a Fourier Transform pair.

8. Write short notes as: i) Thermal Noise ii) Properties of band limited processes

Code No: X0421 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Com. to ECE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain the following
   i) Axioms of probability ii) Independent events iii) Total probability

   b) A and B are events such that $p(A \cup B) = \frac{3}{4}$ $p(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{2}{3}$ find $p(\overline{A}/B)$

   c) In a group of external number of men and women 10% men and 45% women are unemployed. What is the probability that a person selected at random is employed?

2. a) If the communicative distribution function of a random variable x is given by

$$f_X(x) = \begin{cases} 1 - \frac{4}{x^2} & x \geq 2 \\ 0 & x \leq 2 \end{cases}$$

   Find i) $p(x<3)$ ii) $p(4<x<5)$ iii) $p(x \geq 3)$
   b) Explain about Poisson distribution and density functions.

3. a) Let x be a random variable with distribution f_x given by

$$f_X(x) = \begin{cases} 1 - e^{-\lambda x} & 0 \leq x \leq \infty \\ 0 & \text{other wise} \end{cases}$$

   Find the pdf of x. Determine the mean and variance of the distribution.

   b) Find the moment generating function (MGF) for the distribution $f_x(x)=\frac{1}{2^x}$ x=1,2,3……..
   Also find its mean.

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The pdf is given by

$$f_{XY}(x,y) = \frac{6}{5}(x+y^2) \quad 0 \le x \le 1, \quad 0 \le y \le 1$$
$$= \quad 0 \qquad \text{other wise}$$

i) Find the marginal pdf of x and that of y

ii) Find $p\left[\frac{1}{4} \le y \le \frac{3}{4}\right]$

b) Explain about conditional distribution and density internal conditioning.

5. a) Let(x,y) be two dimensional random variable described by joint pdf.

$$f_{XY}(x,y) = 8xy \quad 0 \le x \le 1, \quad 0 \le y \le x$$
$$= 0 \qquad \text{else where}$$

Find the cos (x,y)

b) Explain about "jointly Gaussian random variables"

6. a) Discus the stationarity of the random process $x(t) = A\cos(Wot + \theta)$ where A and Wo are constants and θ is a uniformity distributed random variable in $(0,2\pi)$

b) Consider two random processes x(t)=3 cos (wt+θ) and y(t)=2 cos(wt+θ-$\pi/2$) where θ a random variable distributed in $(0,2\pi)$

prove that $|R_{xy}(\tau)| \le \sqrt{R_{xx}(0)\,R_{yy}(0)}$

7. a) The psd of a random process is given by

$$S_{xx}(w) = \begin{cases} \pi & |w| < 1 \\ 0 & else\ \ where \end{cases}$$

Find its Auto correlation function

b) What is cross power density spectrum? State its properties

8. a) Find the output power density spectrum and output Auto correlation function for a system with

$h(t) = e^{-t}$ $\quad t \ge 0$ for as input with psd = $\dfrac{ho}{2}$ $\qquad -\infty < t < \infty$

b) Write short notes on "effective noise temperature".

Code No: X0421 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Com. to ECE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Define the following and give are example for each of the following
   i) Discrete and continuous sample space
   ii) Mutually Exclusive event
   iii) Equally likely event
   b) A letter is known to have come either from LONDON or CLIFTON. On the post card only two consecutive letters as 'ON' are legible what is the chance that it came from LONDON.
   c) What is the probability that a randomly selected integer chosen from the first 100 positive integers is odd?

2. a) The distribution for x is defined by $f_X(x) = \begin{cases} 0 & \text{for } x < 0 \\ 1 - \frac{1}{4} e^{-x} & \text{for } x \geq 0 \end{cases}$

   Determine p(x=0) and p(x>0)

   b) Explain about "Binominal distribution and density functions"

3. a) A continuous distribution is given by $fx(x) = \frac{1}{x\sqrt{2\pi}} e^{-(\log x)^2} \quad x \geq 0$
   $= 0$

   Find the mean, standard deviation, coefficient of skewness of this distribution

   b) The characteristic function for a Gaussian random variable x, having R mean value of zero is
   $q_X(w) = \exp\left|- j\sigma^2 w^2 / 2\right|)$ Find all the moments of x using q_X (w)
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The joint pdt of the two dimensional r.v(x,y) is given by

$$fxy(x,y) = \frac{1}{4} e^{|x| - |y|} \qquad -\infty < x < \infty, \quad -\infty < y < \infty$$
$$= 0 \qquad else\ where$$

i) Check whether x and y are independent
ii) p(x≤1, y≤0)

b) The probability density function of two statistically independent random variables X and Y are

$$fx(x) = \begin{cases} \frac{3}{32}\ (4 - x^2) & -2 \le x \le 2 \\ = 0 & else\ where\ in\ x \end{cases}$$

$$fy(y) = \frac{1}{2}\left[x(y+1) - u(y-1)\right]$$

Find the exact probability density of the sum w=x+y

5. a) Two random variable have a uniform density on a circular region defined by

$$fxy(x,y) = \frac{1}{\pi r^2} \quad x^2 + y^2 \le r^2$$
$$= 0 \qquad else\ where$$

Find the mean value of the function $g(x,y)=x^2+y^2$

b) Two random variables x and y have the joint characteristic function

$$q_{xy}(w_1, w_2) = \exp\left(-2w_1^2 - 8w_2^2\right)$$

Show that i) x and y are both zero mean random variable ii) x and y are uncorrelated

6. a) Explain the following w.rto Random processes
i) Strict sense stationary ii) Mean Ergodic processes.
b) Explain about Poisson Random processes

7. a) For a random process x(t), assume that $Rxx(\tau) = \rho\, e^{-\tau^2/2a^2}$ where ρ>0 and a>0 are constants. Find the power density spectrum of x(t)
b) Prove that the cross power spectrum and cross correlation function of Random process form a Fourier transform pair.

8. a) Define a given system and derive a relation between the input and output spectra of the system.
b) Explain "Resistive noise" in detail.

Code No: X0522 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPTER SCIENCE
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Obtain the principle conjunctive normal form of the A given by $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$ and hence find disjunctive normal form of A
   b) Show that $(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology. (8M+8M)

2. a) Using CP or otherwise obtain the following implication $(\forall x)(P(x) \rightarrow Q(x)),\ (\forall x)(R(x) \rightarrow \neg Q(x)) \Rightarrow (\forall x)(R(x) \rightarrow \neg P(x))$
   b) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S), \neg R \vee P, Q$ (Use Rule CP) (8M+8M)

3. a) Show that the relation R is defined N x N by (a,b) R (c,d) if and only if a+d = b+c is an equivalence relation.
   b) What is Lattice? Explain its properties. (8M+8M)

4. a) Let Z be the set of integers. o is an operation in Z defined by a o b = a + b +1. Prove that (Z, o) is a semi group.
   b) Show that the set N of natural numbers is a semi group under the operation x * y = max { x, y }. Is it a monoid? (8M+8M)

5. a) A sample of 80 people revealed that 25 like cinema and 60 like television programmes. Find the number of people who like both cinema and television programmes.
   b) Find the number of arrangements of the letters of TENNESSEE.
   c) A cricket 11 is to be selected out of 14 players of whom 5 are bowlers. Find the number of ways in which this can be done so as to include at least 3 bowlers.
   d) How many 3-digit numbers can be formed if 3 and 4 are not adjacent to each other. (4M+4M+4M+4M)

6. a) Solve the recurrence relation $a_n = a_{n-1} + n^2$ where $a_0 = 7$ by substitution method.
   b) Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ for n >= 2 with initial conditions $a_0 = 10$ and $a_1 = 41$ by using generating functions. (8M+8M)

7. a) What are the steps involved in graph traversal using Breadth-First Search algorithm? Illustrate with an example.
   b) State and prove Euler's formula for a connected planar graph. (8M+8M)

8. a) State and prove the first theorem of graph theory.
   b) What is Hamiltonian cycle? How to determine whether Hamiltonian cycle exists in a given graph or not? (8M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0522 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPTER SCIENCE
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Obtain PDNF and PCNF for the following $P \to (P \wedge (Q \to P)$
   b) Show that $\neg (P \vee (\neg P \wedge Q)) \Leftrightarrow \neg P \wedge Q$
   c) Prove that $(P \to Q) \Rightarrow (\neg Q \to \neg P)$ (8M+4M+4M)

2. a) Show that $R \to S$ can be derived from the premises $P \to (Q \to S)$, $(\neg R \vee P)$ and Q.
   b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises
   $P \vee Q$, $Q \to R$, $P \to M$, and $\neg M$ (8M+8M)

3. a) Let R denote a relation on the set of all ordered pairs of positive integers by
   (x,y) R (u,v) iff xv = yu. Show that R is an equivalence relation.
   b) Let X = { 1, 2, 3 } and f, g, h and s are functions from X to X given by
   f = { (1,2), (2,3), (3,1) }, g = { (1,2), (2,1), (3,3) }, h = { (1,1), (2,2), (3,1) }
   s = {(1, 1), (2, 2), (3, 3)}.
   Find f o g, g o f, f o h o g, s o g, g o s, s o s, f o s, f o f. (8M+8M)

4. a) Show that the set of all positive rational numbers forms an abelian group under the composition defined by a * b = ab/4.
   b) If for a group G, f: G → G is given by $f(x) = x^2$ for all $x \in G$ is a homomorphism, prove that G is abelian. (8M+8M)

5. a) Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7. Also indicate how many are divisible by 3 or 7 but not by 5 and divisible by 3 or 5.
   b) In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, PUN, DOG, or BYTE occurs? (8M+8M)

6. a) Solve the Fibonacci relation $a_n = a_{n-1} + a_{n-2}$ with $a_0 = 0$ and $a_1 = 1$ as initial conditions.
   b) Solve the recurrence relation $a_n - 4\, a_{n-1} + 3\, a_{n-2} = 0$ for n >= 2 with initial conditions $a_0 = 2$ and $a_1 = 4$ by using generating functions. (8M+8M)

7. a) List and explain the representations of graphs with example.
   b) Explain the algorithm for Depth-First Search traversal of a graph. (8M+8M)

8. a) Prove that in any non-directed graph there is an even number of vertices of odd degree.
   b) Define isomorphism. What are the steps followed in discovering the isomorphism. (8M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0522 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPTER SCIENCE
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Obtain the product of sums canonical form of the following formulae.
   i) $(\neg P \rightarrow R) \wedge (Q \rightarrow P)$
   ii) $\neg (P \vee Q)$
   b) Write the symbolic statement of the following.
   i) If Rita and Sita go to I.T. camp and Jim and John go to P.C. camp then the college gets the good name.
   ii) It is not true that Ramu reads Times or DC but not The Hindu.
   c) Let P: Ramu is smart, Q: Shamu is clever. R: Dholu is intelligent be the prepositions. Write The following prepositions into statement form.
   i) $(P \rightarrow R) \wedge (Q \rightarrow P)$
   ii) $Q \leftrightarrow P$ (8M+4M+4M)

2. a) Show that the following premises are inconsistent
   i) If the contract is valid, then John is liable for penalty.
   ii) If John is liable for penalty, he will go bankrupt.
   iii) If the bank will loan him money, he will not go bankrupt.
   iv) As a matter of fact, the contract is valid and the bank will loan him money.
   b) Show the following using the automatic theorem
   i) $P \wedge \neg P \wedge Q \Rightarrow R$ ii) $R \Rightarrow P \vee \neg P \vee Q$ (8M+8M)

3. a) Consider the relation R = { (1,3), (1,4), (3,2), (3,3), (3,4) } on A = {1, 2, 3, 4}.
   i) Find the matrix representation of R.
   ii) Find R^{-1}
   iii) Draw the directed graph of R
   iv) Find the composition relation of R o R
   b) Let f: R→ R be defined by f(x) = 2x +5. Show that f is bijection and find f^{-1}. (8M+8M)

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) Show that the set of all elements a of an Abelian group G which satisfy $a^2 = e$ forms a subgroup of G.

   b) Let G be a multiplicative group and $f: G \rightarrow G$, such that for $a \in G$, $f(a) = a^{-1}$. Prove that f is one-to-one, onto. (8M+8M)

5. a) How many ways are there to seat 10 boys and 10 girls around a circular table, if boys and girls seat alternatively.

   b) Find the number of different ways in which 4 boys and 6 girls may be arranged in a row so that no two boys shall be together.

   c) Prove that $C(n+3, r) – 3C(n+2, r) + 3C(n+1, r) – C(n, r) = C(n, r-3)$ (4M+4M+8M)

6. a) Solve $a_n + a_{n-1} – 5\, a_{n-2} + 3a_{n-3} = 0$

   b) Solve $a_n + 7a_{n-1} + 10\, a_{n-2} = 0$, $n >=2$ with $a_0 = 10$, $a_1 = 41$. (8M+8M)

7. a) Prove that a complete bipartite graph $K_{m,n}$ is planar if m <= 2 or n <=2.

   b) Suppose that G is a connected planar graph. Determine | V | if G has 35 regions each of degree 6. (8M+8M)

8. a) Distinguish between cycle and circuit. Give suitable example for each.

   b) Determine the number of edges in

   i) Complete graph K_n

   ii) Complete bipartite graph $K_{m,n}$

   iii) Cycle graph C_n

   iv) Path graph P_n (8M+8M)

Code No: X0522 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
MATHEMATICAL FOUNDATIONS OF COMPTER SCIENCE
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Write converse and contra positive of the following.
   i) $P \to (Q \to R)$ ii) $(P \wedge (P \to Q)) \to Q$
   b) Show the following implications without constructing the truth tables.
   i) $((P \vee \neg P) \to Q) \to ((P \vee \neg P) \to R) \Rightarrow (Q \to R)$ ii) $\neg Q \wedge (P \to Q) \Rightarrow \neg P$ (8M+8M)

2. a) Determine the validity of argument: My father praises me if I can be proud of myself. Either I do well in sports or I can't be proud of myself. If I study hard, then I can't do well in sports. Therefore if father praises me, then I do not study well.
   b) Verify the validity of the following inference: If one person is more successful than other, then he has worked harder to deserve success. Naveen has not worked harder than Anil. Therefore, Naveen is not more successful than Anil. (8M+8M)

3. a) What is Hasse diagram? What is the procedure for drawing it for a poset? Draw Hasse diagram of Poset $(D_{12}, \mid)$.
   b) Show that x! is primitive recursive, where 0! = 1 and n! = n*(n-1)! (8M+8M)

4. a) Let (S, *) be a semi group where S = { a, b }, a * a = b. Show that
   i) a * b = b * a ii) b * b = b
   b) The operation o defined on Z such that a o b = a + b – ab for a, b $\in$ Z. Show that (Z, o) is a monoid. (8M+8M)

5. a) In a language survey of students it is found that 80 students know English, 60 know French, 50 know German, 30 know English and French, 20 know French and German, 15 know English and German and 10 students know all the three languages. How many students know
   i) at least one language ii) English only
   iii) French and one but not both out of English and German iv) at least two languages.
   b) Show that
   i) C(n, r) = C(n-1, r-1) + C(n-1, r) ii) P(n, r) = n P(n-1, r-1) (8M+8M)

6. a) Solve the recurrence relation $a_r = 2 a_{r-1} + 1$ with $a_1 = 7$ for r > 1 by substitution method.
   b) Find the coefficient of x^{10} in i) $(1 + x + x^2 + \ldots)^2$ ii) $1 / (1 – x)^3$ (8M+8M)

7. a) Show that a complete graph k_n is planar iff n<=4.
   b) Explain the algorithm for Breadth-First search traversal of a graph. (8M+8M)

8. a) Define the following graphs with a suitable example for each graph
   i) Complement graph ii) Euler path iii) Hamiltonian graph iv) Multi graph.
   b) Prove that a non-directed multigraph has an Euler circuit if it is connected and all its vertices are of even degree. (8M+8M)

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~