Code No: R21029 **R10** SET - 1

II B. Tech I Semester Supplementary Examinations, June - 2015
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1 a) Briefly explain about Coulomb's Law.
b) Two point charges $Q_1 = 2 * 10^{-4}$ C located at (1,2,4), $Q_2 = 2 * 10^{-4}$ C located at (1,2,-3) & $Q_3 = -4 * 10^{-4}$ C located at (2,0,6) are placed in air. Find the vector F_2 on charge Q_2.

2 a) Explain in detail about electric dipole and dipole moment.
b) Two equal charges Q are at the opposite corners of a square of side a, and an electric dipole of moment m is at a third corner, pointing towards one of the charges. If $m=2\sqrt{2}$ Qa, show that the field strength at the fourth corner of the square is $\sqrt{\frac{17}{2}}\frac{Q}{4\pi\varepsilon_0 a^2}$.

3 a) Explain in detail about Polarization and derive the relation between D, E & P.
b) Explain in detail about Equation of continuity.

4 a) Explain in detail about Magnetic Field Intensity due to a circular coil.
b) A solenoid of radius 20cm is 50 cm long, when a current 10 amps flows in a coil. Find the MFI and flux density at a point on the axes distance 40 cm from one end.

5 a) Derive the Maxwell's third equation, Curl (H)=Jc.
b) Develop the expression for MFI due to a square current loop.

6 a) Define magnetic pole strength and hence develop the expression for MFI in terms of both scalar and vector magnetic potentials.
b) Explain in detail about Lorentz force equation.

7 a) Evaluate the inductance of a solenoid of 2800 turns wound uniformly over a length 0.6m on a cylindrical paper tube 4 cm in diameter and the medium is air.
b) Derive the mutual inductance between a straight long wire and a square loop wire in the same plane.

8 a) State and explain in detail about Poynting Theorem.
b) Explain briefly about Maxwell's equations for different cases.
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Code No: R21029 **R10** SET - 2

II B. Tech I Semester Supplementary Examinations, June - 2015
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

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

1 a) Derive the Maxwell's equation $Div\ D = \rho_v$
b) Calculate the force on a unit positive charge at P(x=2m, y=0) due to the charges Q1 at origin and Q2 at (x=1m, y=0) where Q1=1000 Pico coulombs Q2= -2000 Pico coulombs.

2 a) Explain and derive Poisson's & Laplace's equation.
b) Derive torque equation on an electric dipole in an electric field.

3 a) Show that $\frac{Tan\theta_1}{Tan\theta_2} = \frac{\varepsilon_{r1}}{\varepsilon_{r2}}$ when refraction of the electric field at a boundary free of charge.
b) Derive the capacitance of a concentric cylindrical conductor.

4 a) Derive the Magnetic Field Intensity due to a square carrying wire.
b) A steady current of i amps flow in a conductor bend in a form of square loop of side 'a'. Find the Magnetic Field Intensity at the centre of the loop.

5 a) State and Explain Ampere's Law.
b) In the region 0<r<2 in cylindrical coordinate system. A current density is given by J = $6e^{-r}a_z$ A/m^2, find MFI.

6 a) Derive the force equation between two parallel conductors.
b) Derive torque equation when a current loop placed in magnetic field.

7 a) A solenoid having a mean diameter of 20 cm & length of 50 cm having 1000 turns. The coil is placed coaxially inside the other solenoid having a mean diameter of 60 cm and number of turns equal to 2000 and length of the outer solenoid is equal to that of inner solenoid. Compute L1, L2 & M, neglect magnetic leakage medium and medium is air.
b) Explain in detail about energy stored and energy density in a magnetic field.

8 a) Show that the displacement current density will be equal to the rate of change of electric flux density in time varying field.
b) Explain in detail about statically and dynamically induced EMFs.

Code No: R21029 **R10** SET - 3

II B. Tech I Semester Supplementary Examinations, June - 2015
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1 a) State and explain about Gauss's law.
b) Calculate the Electric Field Intensity due to a straight conductor.

2 a) Briefly explain about Conductors and Insulators.
b) Find the potential V at the point p(2,3,4) for the field of two co-axial conducting cylinders, given V=60v and $\rho = 3m$ & V=10v at $\rho = 5m$.

3 a) Derive the energy stored and energy density in a static electric field.
b) A parallel plate capacitor consists of two square metal plates with 500 mm side and separated by 10 mm. A slab of sulpher ($\varepsilon_r = 4$) 6mm thick is placed on the lower plate and air gap of 4 mm. Find the capacitance of the capacitor.

4 a) Derive the Maxwell's second Equation, Div(B)=0.
b) Find the magnetic field due to a current I in a coaxial cable whose inner conductor has radius a and the outer conductor has the radii b, c (b < c).

5 a) Develop the expression for MFI of an infinite sheet of current using the concept of magnetic vector potential.
b) Explain in detail about Point form of Ampere's circuital law.

6 a) Derive the force on a straight and a long current carrying conductor in a magnetic field.
b) A single phase circuit comprises two parallel conductors A & B, each 1cm diameter and spaced 1m apart. The conductors carrying current of +100 & -100 Amps respectively. Determine the field intensity at the surface of each conductor and also in space exactly mid way between A & B.

7 a) A solenoid with 300 turns, 300mm long & 30 mm diameter, if the current is 500 mA and assume $\mu_r = 1$. Find (1) Inductance (2) Energy stored in solenoid.
b) Explain and Derive self inductance of a toroid.

8 a) Show that the curl of the magnetic and electric field intensities enclosed by a closed surface will lead to the power transferred through the surface.
b) Explain about vector form of Faraday's law.
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Code No: R21029 **R10** SET - 4

II B. Tech I Semester Supplementary Examinations, June - 2015
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

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

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1 a) Explain in detail about potential gradient.
b) Two point charges Q_1 = 2nC, Q_2 = 4 nC are located at points (1,1,1) and (1,0,0) respectively. Determine the potential at point (1,1,0).

2 a) Write the procedure to solve Laplace equation by using direct method.
b) Explain in detail about behaviour of conductors in an electric dipole.

3 a) Derive the equations for Conduction and Convection current densities.
b) Explain in detail about Ohm's law in point form

4 a) Develop the expression for Magnetic Field Induction of a straight sheet of current using the concept of magnetic vector potential.
b) Explain in detail about Biot-Savart's law.

5 a) Find the Magnetic Field Induction due to a rectangular loop using Ampere's law.
b) Find the magnetic field of current in a straight circular cylindrical conductor of radius a.

6 a) Show that $\frac{Tan\theta_1}{Tan\theta_2} = \frac{\mu_{r1}}{\mu_{r2}}$ at the magnetic interface.
b) Derive force on a differential current element in a magnetic field.

7 a) Write the characteristics of scalar magnetic potential and also write its limitations.
b) Explain and derive self inductance of a long solenoid.

8 a) Derive Maxwell's fourth equation, Curl (E)= -∂B/∂t.
b) Show that the curl of the magnetic and electric field intensities enclosed by a closed surface will lead to the power transferred through the surface.
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