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

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017
ELECTRO MAGNETIC FIELDS
(Electrical and Electronics Engineering)
(2012 ADMITTED B.TECH AND 2013 LATERAL ENTRY B.TECH ONLY)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) A charge of 12nC is distributed uniformly along a line of length 10m. Find the field intensity at a radial distance of 4m from the center of the line, assuming air medium. (8M)
   b) State and prove Gauss's law in integral form, considering static charges in free space. (7M)

2. a) Derive and expression for the potential difference at any point between spherical shells in terms of applied potential using Laplace equation (8M)
   b) Explain and define the potential at a point in an electric field. Derive the potential at any point in a field due to a point change. (7M)

3. a) State and prove the conditions at the boundary between two dielectrics. (8M)
   b) A parallel plate capacitor with a large plate area is situated in air. With a potential difference of 100 V between the plates, the stored energy 44.21 μJ/ unit area. Find the distance of separation between the plates. (7M)

4. a) Starting from Biot - Savart's law, obtain the expression for the magnetic field $\bar{B}$ due to a steady surface current in free space. (8M)
   b) Derive an expression for magnetic field intensity at a height 'h' on the axis of a circular wire carrying a current of I amps. (7M)

5. a) A current carrying circular wire of radius 'a' is centered around the origin in the plane z=0. Obtain an expression for magnetic field intensity on the axis of the wire at (0,0,d). (8M)
   b) Find the magnetic field of a very long solenoid consisting of N closely wound turns per unit length on a cylinder of radius R and carrying a steady current I. Use Ampere's law. (7M)

6. a) What is a magnetic dipole. How does a magnetic dipole differ from an electric dipole and explain magnetic dipole movement. (8M)
   b) Derive the expression for torque on a current loop placed in a magnetic field. (7M)

7. a) A torroid is made up of two semicircular rings of iron and steel held together tightly. Cross sectional area of each part is 5 sq.cm and mean radius of torroid is 20 cm. Relative permeabilities of steel and iron are respectively 2500 and 450. The exciting coil has 500 turns. Find inductance of the system. (8M)
   b) Derive an expression for energy stored in a magnetic field. (7M)

8. a) Derive the integral and point form of Maxwell's equations from Faraday's law and Ampere's law. (7M)
   b) Explain Poynting theorem and derive expression for Poynting vector. (8M)
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