Code No: 113BY **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
ELECTROMAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

1.a) State the expression for the force between one charge point to an array of a charge points? [2]
b) State and explain Guass's law. [3]
c) Give ohms law in point form. [2]
d) Brief about the concept of Polarization in materials. [3]
e) Define Ampere's circuital law and its applications. [2]
f) Obtain Maxwell's second equation. [3]
g) Derive Expression for Vector Magnetic Potential. [2]
h) Write the applications of Permanent Magnets. [3]
i) State Faraday's law of Electromagnetic induction. [2]
j) What is displacement current? Explain. [3]

PART-B

(50 Marks)

2. Deduce the Expression for $\bar{E}$ due to a electric dipole? A field is given in spherical co-ordinate system P (r=5, $\theta = 30^0$, $\Phi=60^0$) as $\bar{E} = \left(20\bar{a}_\gamma - 30\bar{a}_\theta + 60\bar{a}_\phi\right)$ v/m. Find the incremental work done in moving a 10 μC charge through a distance of 0.8 μm in the direction of a) $\bar{a}_\gamma$ b) $\bar{a}_\theta$ c) $\bar{a}_\phi$. [10]

OR

3. Prove the Expression $\bar{E} = \bar{\nabla} V$? Where E is the Electric Field Intensity and V is the scalar Potential? A uniform line of charge ρ_l = 2.5 μC/m lies along the z-axis and a circular cylinder of radius 3m has a surface charge density of ρ_s = -0.12 μC/m^2, Both the distributions are infinite in extent with respect to z-axis. Using Gauss's law. Find $\bar{D}$ in all regions. The region is free space? [10]

4. Derive the Expressions for the Boundary conditions between two perfect dielectrics. [10]

OR

5. Prove that the convection current density is linearly proportional to the charge density and the velocity with which the charge is transferred. [10]

6.a) The Magnetic Field Intensity $\overline{H}$ due to a infinite current carrying sheet, Assume a current $\bar{k}$ in xz-plane, Prove that, $\overline{H} = \frac{k_y}{2}\overline{a_{n_y}}$.

b) Find the Magnetic Field Intensity $\overline{H}$ at a point p(0.01 ,0, 0)m , if the current through a co-axial cable is 6A , which is along z-axis and a= 3mm, b = 9mm, c = 11mm? [5+5]

OR

7. By using Ampere circuital law, derive the Expression for Magnetic Field Intensity $\overline{H}$ due to a infinite long current carrying conductor. Find the Magnetic field Intensity at a radius of 0.5m from a long straight line conductor carries a current of 2A/m. [10]

8. Derive the expressions for coefficient of coupling and equivalent inductance for various connections of magnetic circuits? If a coil of 800μH is magnetically coupled to another coil of 200μH. The Coefficient of coupling between two coils is 0.05 Calculate the inductance, if two coils are connected in a) series aiding b) series opposition c) parallel aiding and d) parallel opposing. [10]

OR

9. Derive the Expressions for Scalar and Vector magnetic potentials. Derive the Expressions for Laplace's and Poisson's equation for magnetic field. [10]

10. Derive the Maxwell's Equations for Time Varying Fields. [10]

OR

11.a) A conductor of length 100cm moves at right angles to uniform field of strength 10000 lines per cm^2, with a velocity of 50 m/s. Calculate e.m.f. induced it when the conductor moves at a angle 30^0 to the direction of field?

b) An a.c voltage source $\vartheta(t) = V_0 \sin wt$ is connected across a parallel plate capacitor of capacitance 'C'. Show that the displacement current in the capacitor is the same as the conduction current in the wires. [5+5]

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