Code No: 133AP

<div style="text-align:right">**R16**</div>

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, April/May - 2018
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

<div style="text-align:right">(25 Marks)</div>

1.a) Define electric field intensity and electric potential and write the relationship between them. [2]
  b) What is meant by boundary condition? How they are useful? Explain. [3]
  c) Define polarization. Is polarization is present in conductors. [2]
  d) State properties of conductor and dielectric materials. [3]
  e) Explain the concept of non existence of isolated magnetic pole. [2]
  f) Write the expression for Lorentz force equation and write its significance. [3]
  g) What is a magnetic dipole? How it is differ from electric dipole? [2]
  h) Write the expressions for Force on a straight and a long current carrying conductor in a magnetic field when the current in the conductors is in same direction and opposite directions. [3]
  i) Write the integral and point forms of Faraday's laws. [2]
  j) Define Poynting vector. [3]

PART-B

<div style="text-align:right">(50 Marks)</div>

2.a) 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.
  b) Find the electric field at distance 'z' above the center of a flat circular disc of radius 'r', which carries a uniform surface charge. [5+5]

OR

3.a) Derive the Relationship between electric field and electric potential.
  b) A Charge of -0.3 µC is located at A(25, -30, 15) (in cm) and a second charge of 0.5 µC is at B(-10, 8, 12) cm. Find **E** at (i) the origin (ii) P(15, 20, 50) cm. [5+5]

4.a) Explain different types of polarization.
  b) Find the maximum charge that can be held on the isolated sphere 2m diameter, the sphere being in air with dielectric strength 40 kV/cm. What would be the maximum charge if this sphere were in oil of $\varepsilon_r = 3.5$ and dielectric strength of 75 kV/cm. [5+5]

OR

5.a) What is meant by electric dipole? Derive the expression for electric field intensity due to electric dipole.
  b) Two dipoles with dipole moments -5 a_z nC/m and 9 a_z nC/m are located at points (0, 0, -2) and (0, 0, 3) respectively. Find the potential at the origin. [5+5]

6.a)   A filamentary current of 15A is directed in from infinity to the origin on the positive x axis and then back out to infinity along the position yaxis. Use the Biot-Savart's law of find H at P (0, 0, 1)?

   b)   Find the magnetic field intensity at centre of a square of sides equal to 5m and carrying a current equal to 10 A.   [5+5]

OR

7.a)   State Ampere's circuital law and explain any two applications of Ampere's Circuital law.

   b)   Obtain the expression for magnetic field intensity due to infinite long straight carrying a steady current I.   [5+5]

8.a)   Discuss about Torque on a current loop placed in a magnetic field.

   b)   A charged particle has mass 2 kg and charge 3 C. it starts at point (1, -2, 0) with velocity $4a_x + 3a_z$ m/s in an electric field $12 a_x + 10 \mathbf{a}_y$ V/m. At time t = 1s, determine:
         i) The acceleration of the particle   ii) Its velocity.   [5+5]

OR

9.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)   Two parallel circular loops of radii 10 m and 2 m, are coaxially located and carry currents 20A and 5 A respectively. Find the force between the loops if the axial distance between the centers of the loops is (i) 30 m (ii) 40 m.   [5+5]

10.a)   State the Poynting Theorem and derive the necessary expressions.

    b)   Explain the concept of displacement current and obtain an expression for the Displacement current density.   [5+5]

OR

11.a)   Explain (i) Conduction Current. (ii) Displacement current.

    b)   Derive the Maxwell's four equations for time varying fields.   [5+5]

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