PVP 19

Code: 19EE3404

II B.Tech - II Semester – Regular Examinations – AUGUST 2021

ELECTROMAGNETIC FIELDS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) What is the Gaussian surface for a uniform line charge distribution? Give reason.
   b) Write the expression for Electric field intensity due to an electric dipole.
   c) Which law in magnetostatics is analogous to Coulomb's law in electrostatics?
   d) State the Lorentz force equation.
   e) What is the modification of Maxwell's III equation for time varying fields?

PART – B

UNIT – I

2. a) Derive point form of Gauss's law. 4 M
   b) Given that $\overline{D} = z\rho cos^2\emptyset\overline{a_z}$ C/m^2, calculate the charge density at (1, π/4, 3) and the total charge enclosed by the cylinder of radius 1 m with $-2 \leq z \leq 2\ m$. 8 M

OR

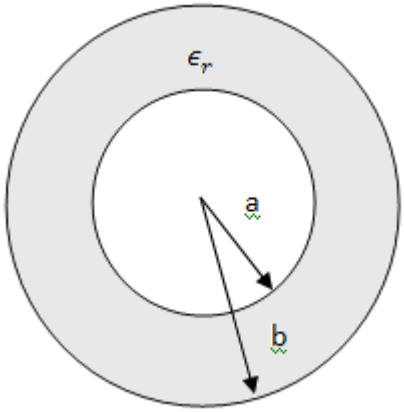
3. a) Show that gradient of potential is electric field intensity. 6 M

   b) Given the potential, $V = \frac{10}{r^2}\sin\theta\cos\emptyset$, Find $\overline{D}$ at (2,π/2,0). 6 M

UNIT – II

4. a) Using Laplace's equation, derive the expression for capacitance of a cylindrical capacitor. 6 M

   b) Figure below represents the cross section of two spherical capacitors, determine the capacitance. Let a = 1 mm, b = 3 mm, and ϵ_r = 2.5.



6 M

OR

5. a) Derive the boundary conditions at the interface between two dielectrics. 6 M

   b) Derive the expression for torque on an electric dipole in an electric field. 6 M

UNIT-III

6. a) Using Biot-Savart'slaw, derive an expression for the magnetic field intensity in the vicinity of a straight current carrying conductor of finite length. 6 M

   b) Derive the expression for MFI at a point due to an infinite sheet of current. 6 M

OR

7. a) Derive an expression for magnetic flux density at any point on the axis of a plane circular current loop. 6 M

   b) A circular loop located on $x^2 + y^2 = 9$, z = 0 carries a direct current of 10 A along $\overline{a_\emptyset}$. Determine $\bar{H}$ at (0, 0, 4) and (0, 0, -4). 6 M

UNIT – IV

8. a) Determine the force between two linear parallel conductors carrying currents in opposite directions. 6 M

   b) Calculate the inductance of a solenoid of 2000 turns wound uniformly over a length of 500mm on cylindrical paper tube 40mm in diameter. The medium is air. 6 M

OR

9. a) If the magnetic field is H= $(0.01/\mu_0)\ \overline{a_x}$ A/m, what is the force on a charge of 1.0 pC moving with a velocity of $10^6\,\overline{a_x}$ m/s. 6 M

   b) Derive the expression for energy in a magnetostatic field. 6 M

UNIT – V

10. a) Explain the statically and dynamically induced emf's. 6 M

    b) Write the Maxwell's equations both in point and integral forms for time varying fields. 6 M

OR

11. a) Describe the Poynting theorem and derive its necessary expression. 6 M

    b) A conducting circular loop of radius 20 cm lies in the z=0 plane in a magnetic field
    B =10cos 377t $\overline{a_z}$ mWb/m^2.
    Calculate the induced voltage in the loop. 6 M