PVP 20

Code: 20BS1401

II B.Tech - II Semester – Regular Examinations – JULY 2022

ELECTROMAGNETIC FIELD THEORY
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Define electric field intensity. Point charges 2mC and -4mC are located at (4,2,-1) and (-1,1,2), respectively. Calculate the electric field intensity at a point (0, 3, 2) 7 M
   b) State gauss law. Calculate E due to infinitely long conducting wire placed along Z axis. 7 M

OR

2. a) In free space, electric potential $V=x^2y(z+3)$ volts. Calculate the electric field intensity at (3, 5, 6). 7 M
   b) Explain the physical significance of divergence operator and curl operator acting on a vector quantity. State the divergence theorem. 7 M

UNIT – II

3. a) A cylindrical capacitor consists of an inner conductor of radius ‘a’ & an outer conductor whose inner radius is ‘b’. The space between the conductors is filled with a dielectric permittivity ε_r & length of the capacitor is L. Determine the capacitance. 7 M

b) Explain the concept of polarization of dielectrics. 7 M

OR

4. a) Derive the electrostatic field's boundary conditions for a dielectric-dielectric interface. 7 M

b) Derive Poisson's and Laplace's equations. 7 M

UNIT-III

5. a) Derive the equation to show that curl of magnetic field intensity is equal to current density. 7 M

b) Find magnetic field strength, H, on the Z-axis at a point P (0, 0, h), due to a current 'I' carrying circular loop, $x^2+y^2= A^2$ in Z=0 plane. 7 M

OR

6. a) Using Biot-Savart's law, derive the magnetic field intensity due to infinite length conductor carrying current 'I'. 7 M

b) Explain why isolated magnetic pole does not exist and prove the second Maxwell equation div (B)=0. 7 M

UNIT – IV

7. a) Discuss about Torque on a current loop placed in a magnetic field. 7 M

b) The core of a toroid is $12cm^2$ and is made of material with μ_r= 200. If the mean radius of the toroid is 50cm, calculate the number of turns needed to obtain an inductance of 2.5 H. 7 M

OR

8. 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. 7 M

b) Derive the expression for self-inductance of a toroid. 7 M

UNIT – V

9. a) What is the physical significance of the poynting vector? 7 M

b) Explain the concept of displacement current and obtain an expression for the displacement current density. 7 M

OR

10. a) Write Maxwell's equations for time varying fields and make their word statements. 7 M

b) In a material for which σ = 10 S/m and εr = 2.0, the electric field intensity, is given by $\vec{E}$= 250 $Sin10^{10}t$ V/m. Find the conduction and displacement current densities and the frequency at which they have equal magnitudes. 7 M