

Code: 4G234

II B.Tech. I Semester Supplementary Examinations August 2021

Electromagnetic Fields

(Electrical and Electronics Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

UNIT-I

1. a) Derive the expression for energy density in an electrostatic field. 7M
 b) Point charges 1 mC and -2 mC are located at (3,2,-1) and (-1,-1,4), respectively. Calculate the electric force on a 10 nC charge located at (0,3,1) and the electric field intensity at that point. 7M

OR

2. a) Three point charges -6 micro coulombs, 2 micro coulombs and 4 micro coulombs are located at (-1,-2,-3), (3,2,1) and (1,2,3) respectively. Find the potential at (1,1,1). Assume zero potential at infinity. 8 M
 b) Derive and explain Maxwell's second equation? 6 M

UNIT-II

3. a) Compute the torque for a dipole consisting of 1 micro coulomb charges in an electric field $E=10^3[Za_x - a_y - a_z]$ separated by 1 mm and located on the Z-axis at origin. 7M
 b) Give the expression for capacitance of a coaxial cable with two dielectrics? 7M

OR

4. a) State the properties of Dielectric materials 5M
 b) Derive the Ohm's law in point form? 9M

UNIT-III

5. a) Derive and explain the relationship between Magnetic flux, magnetic Field Intensity and Magnetic Flux density. 7M
 b) Describe the few applications of Ampere's circuital law? 7M

OR

6. Using Ampere's circuital law Find H due to an infinite sheet of current. 14M

UNIT-IV

7. a) Derive the expression for force on a straight current carrying conductor placed in a magnetic field 8M
 b) A current strip 2 cm wide carries a current of 15 A in the a_z direction. Find the force on the strip of unit length if the uniform field is $B= 0.20a_z$ Tesla. 6M

OR

8. a) Derive the expression for force between two long parallel current carrying conductors placed in a magnetic field. 10M
 b) Two long parallel wires 2 meters apart carry currents of 50 A and 100 A respectively in the same direction. Determine the magnitude and direction of the force between them per unit length. 4M

UNIT-V

9. a) Derive the expression of one of the Maxwell's equation $\text{Curl}(E) = \frac{-\partial B}{\partial t}$. 7M
 b) Derive the equation for modified Amperes circuital law for time varying fields. 7M

OR

10. a) Distinguish between Conduction Convection and Displacement Currents. 7M
 b) Find the conduction and displacement current densities a material having conductivity of 10^{-3} S/m and $\epsilon_r=2.5$, if the electric field in the material is $E=5.8 \times 10^{-6} \sin(9 \times 10^9 t)$ V/m. 7M
