Code No: R18A0406 **R18**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech II Semester Supplementary Examinations, April 2023

Electromagnetic Fields & Waves

(ECE)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 a) Find the divergence of A where A= $\rho z \sin\phi a_\rho + 3\rho z^2 \cos\phi a_\phi$. **[7M]**

b) Why Coulomb's law is valid to be considered only for static charges? Why not for moving charges? **[7M]**

OR

2 a) Derive the Relationship between electric field and electric potential. **[7M]**

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. **[7M]**

SECTION-II

3 a) State Gauss's law. Using Gauss's law, derive an expression for electric field intensity due to an infinite line charge. **[7M]**

b) Derive expression for Poisson's and Laplace's Equations. **[7M]**

OR

4 a) State and derive the Maxwell's Equations for electrostatic fields, in both differential and integral forms. **[7M]**

b) Find the Potential and Electric Field due to a small electric dipole located on Z-axis. **[7M]**

SECTION-III

5 a) What is inconsistency in ampere's law, how it can be avoided. **[7M]**

b) State and explain Maxwell's Equations for Magnetostatic Fields. **[7M]**

OR

6 a) A thin ring of radius 5 cm is placed on plane z = 1 cm so that its center is at (0,0,1cm). If the ring carries 50 mA along $\boldsymbol{a}_\emptyset$, find $\boldsymbol{H}$ at (0,0,10cm)? **[7M]**

b) State and explain Faraday's laws of electromagnetic induction with its integral and point forms. **[7M]**

SECTION-IV

7 a) Explain the wave propagation in perfect conductors with suitable equations. **[7M]**

b) Explain the wave propagation in free space and determine the intrinsic impedance for free space. **[7M]**

OR

8 a) A uniform plane wave propagating in a medium has E=0.8 $e^{-\alpha z}$ Sin ($2*10^8 t-\beta z$) **[7M]**

a_y V/m, If the medium is characterized by μ_r=2;ε_r=10;σ=3 s/m. Find α, β and H.

b) A plane sinusoidal wave travelling in a space has E_{max} = 150μV/m **[7M]**

i) Find the accompanying H_{max} ii) Propagation is in X direction and H is Y direction, What is the direction of E. iii) Compute the average power transmitted.

SECTION-V

9 a) State and explain Poynting theorem and Poynting vector. Also derive an expression for average power density. **[7M]**

b) Define Brewster angle and derive equation for it. **[7M]**

OR

10 a) Derive the expression for reflection coefficient. **[7M]**

b) Derive equation for a wave incident normally on a perfect dielectric material. **[7M]**

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