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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Regular) - January- 2024
ELECTROMAGNETIC FIELDS AND WAVES
(ECE)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 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.

PART-A **(20 Marks)**

1. a)	Define Electric Flux? List out the Properties of it?	[2M]
b)	Write a expression for Electric field intensity due to the volume charge distribution.	[2M]
c)	State Biot-Savart's law. ?	[2M]
d)	Define magnetic Field Intensity & Magnetic Flux Density?	[2M]
e)	State Lenz's law?	[2M]
f)	Give an expression for convection current density?	[2M]
g)	State the Poynting theorem?	[2M]
h)	Differentiate between Plane wave & Uniform Plane wave?	[2M]
i)	Write the Relation between λ_g, λ_o, λ_c?	[2M]
j)	Write down the TE/TM wave equations of a waveguide?	[2M]

PART-B **(50 Marks)**

2.a)	Derive the Equation of an Electric Field Intensity Due to line charge Distributions.	[8M]
b)	Obtain the Relation between E and V?	[2M]

OR

3.a)	State and prove Gauss's Law. Find the Electric field Intensity of a surface charge by using Gauss's law?	[6M]
b)	Point charges 5nC and -2nC are located at (2,0,4) and (- 3,0,5), respectively. Find the electric field intensity and electric Flux density D at (1,-3,7)?	[4M]
4.	Using Biot – Savart's law, Derive an Expression for Magnetic Field Intensity due to infinite line current?	[10M]

OR

5.	A point charge of Q=1.2C has Velocity of v=(5ax+2ay-3az)m/s, Evaluate the Magnitude of Force exerted on the charge, if i) E= -18ax+5ay-10az v/m; ii) B= -4ax+4 ay+3az ; iii) if both are present simultaneously.	[10M]
6.	Derive the Boundary conditions for the Tangential & Normal Component of an Electric fields for a. Dielectric – Dielectric. [7M] b. Dielectric – Conductor . [3M]	

OR

7.a)	State and Explain Faraday's laws of electromagnetic induction ?	[5M]
b)	Derive an Expression for Transformer E.M.F.	[5M]

8.a) Define Polarization. Explain different types of polarizations? [5M]

b) Derive the expression for the reflection coefficient for oblique incidence on a perfect dielectric in parallel polarization? [5M]

OR

9 Analyze Relation between E and H in a uniform plane wave. Determine the value of the intrinsic impedance of free space? [10M]

10.a) Develop the relationship between group velocity & phase velocity for a rectangular waveguide? [5M]

b) A rectangular waveguide measures 3 cm × 4.5 cm. Determine the cutoff wave length, cut off frequency for the dominant TM mode? [5M]

OR

11. Derive the Propagation of TM waves in Rectangular Wave guide? [10M]

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