(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024

Paper Code: ECC-213 ***Subject: Electromagnetic Field Theory***

Time: 3 Hours ***Maximum Marks: 60***

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

Q1 Write short, up to the point and clear answer of the following:- **(5x4=20)**

(a) Explain M-method of image briefly.

(b) Explain Gauss Law.

(c) Write four Maxwell's Equations.

(d) A plane wave in a homogeneous medium is expressed as $E=50\sin(\omega t+2z)iy$ V/m, what is the direction of propagation of E and H fields.?

(e) What is lossless transmission line, what will be the numerical value of attenuation constant?

UNIT-I

Q2 (a) Express point **P(-2, 6, 3)** in cylindrical, and **R(-3,-4,-10)** in spherical coordinates. **(5)**

(b) Calculate capacitance of a rectangular parallel plate capacitor. **(5)**

Q3 (a) Explain Stokes' Theorem and Divergence Theorem. **(5)**

(b) Calculate intensity of electric field at perpendicular distance '**r** ' from an infinite line charge, having linear charge density '**λ**'. **(5)**

UNIT-II

Q4 (a) There exists a boundary between two magnetic mediums at z = 0, $\mu = 3\mu 0$ in region 1, z > 0, and $\mu = 2\mu 0$ in region 2, z < 0. If the magnetic flux density in the region 1 is $B1=3ix -2iy -4iz$. Find $B2$ and $H2$ in region 2. Assume no current at the boundary. **(6)**

(b) Explain magnetic vector potential. **(4)**

Q5 (a) Derive the boundary conditions for electric field at the interface of two mediums with no charge at the boundary. **(6)**

(b) Explain the Inconsistency issue associated with Ampere's Law? **(4)**

UNIT-III

Q6 (a) Derive the general expressions for the reflection and transmission coefficients for E fields when an electromagnetic wave is incident normally on the boundary separating the two different media characterized by their characteristic impedances $\eta 1$ and $\eta 1$. **(6)**

(b) Define Poynting vector & derive an expression for poynting theorem. **(4)**

Q7 (a) The electric field intensity of a uniform plane wave propagating in a perfect dielectric having unity relative permeability is $E=10\cos(5\pi * 107t - 0.4\pi Z)$ ax V/m Find (i) frequency (ii) wavelength (iii) phase velocity and (iv)magnetic field intensity B. **(6)**

(b) Explain the importance of phase constant (β) in EM wave. Is it possible that the phase constant become zero for EM wave, justify your answer? **(4)**

UNIT-IV

Q8 (a) A transmission line has a characteristic impedance of 100 ohms and is terminated in a load impedance of ZL=(200+j180) ohms. Find the voltage reflection coefficient. **(5)**

(b) Explain Smith Chart and its applications. **(5)**

Q9 (a) Derive the equation for Characteristic impendence, open circuit impedance and short circuit impedance of transmission line. **(7)**

(b) Explain Reflection Coefficient and VSWR in EM Waves. **(3)**

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