10/12/25
9:30AM

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T3 EXAMINATION - DECEMBER 2025

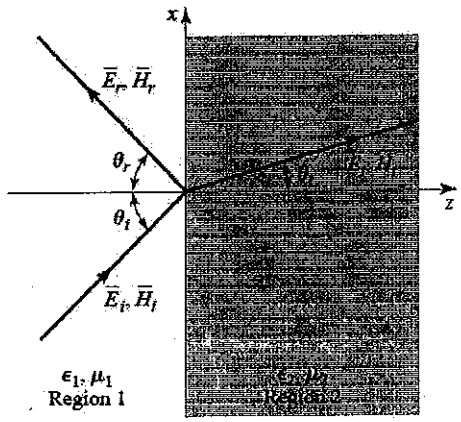
B.Tech-V Semester (ECE)

COURSE CODE(CREDITS): 18B11EC513(4) MAX. MARKS: 35

COURSE NAME: Electromagnetic Waves

COURSE INSTRUCTORS: Salman Raju Talluri MAX. TIME: 2 hrs.

Note: (a) All questions are compulsory. (b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems. (c) Scientific Calculator is allowed.

Q.N	Question	CO	Marks
Q.1	An H field in free space is given as $H(x,t) = 10\cos(10^8 t - \beta x)a_y$ A/m. Find the electric field intensity associated with it using a relevant Maxwell's equation.Then Find (a) β; (b) λ; (c) $E(x,t)$ at P(0.1, 0.2, 0.3) at t = 1 ns.	CO-2	5
Q.2	What do you mean by polarization? Give the equations for different types of Polarizations that are commonly defined in electromagnetic wave propagation.	CO-2	4
Q.3	Consider the figure and write the equations for reflected and transmitted electric field intensities in Region 1 and Region 2, if the incident electric field lies on the plane of incidence. 	CO-3	5

Q.No	Question	CO	Marks
Q.4	Give the statement of Poynting theorem and its significance. Is there any vector called as Pointing Vector? Define it if it exits and its use.	CO-3	3
Q.5	How do you differentiate between TE and TM waves? Derive the equations for field components of TE/TM in the direction of x and y, E_x, E_y, H_x and H_y in terms of E_z and H_z if the wave is propagating in +z-direction.	CO-4	5
Q.6	What are the boundary conditions for electric and magnetic field components on a perfect electrical conductor? Give the boundary conditions that must be applied on the boundaries of a rectangular waveguide by drawing the geometry of RWG.	CO-4	4
Q.7	A rectangular waveguide has dimensions a = 6 cm and b = 4 cm. (a) Over what range of frequencies will the guide operate single mode? (b) Over what frequency range will the guide support both TE_{10} and TE_{01} modes and no others?	CO-5	4
Q.8	Define/Explain the following terms briefly. a) Magnetic permeability and Electric permittivity b) Attenuation Constant and Phase Constant c) Intrinsic Impedance and Characteristic Impedance d) Guided wave propagation and Free-space propagation e) Reflection Coefficient and Transmission Coefficient	CO-5	5