JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2023

B.Tech-V Semester (ECE)

COURSE CODE (CREDITS):18B11EC513 MAX. MARKS: 25

COURSE NAME: Electromagnetic Waves

COURSE INSTRUCTOR: SRU MAX. TIME: 1 Hour 30 Minutes

Note: (a)*All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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1. Write the entire Maxwell's equation in pint form and integral from along with their significance. [4m CO-2]
2. Within a certain region, $\varepsilon = 10^{-11}$ F/m and $\mu = 10^{-5}$ H/m. If $B_x = 2\times10^{-4} \cos(10^5 t) \sin(10^{-3}y)$ T: (a) use $\nabla \times H = \varepsilon \partial E/\partial t$ to find E; (b) Find the total magnetic flux passing through the surface $x = 0$, $0 < y < 40$ m, $0 < z < 2$ m, at $t = 1$ μs; [4 m CO-2]
3. Given the complex amplitude of the electric field of a uniform plane wave, $E_0 = 100a_x + 20\angle 30\ a_y$ V/m, construct the phasor and real instantaneous fields if the wave is known to propagate in the forward z direction in free space and has frequency of 10 MHz. Use a suitable Maxwell's equation to find the magnetic field intensity associated with this. [5m CO-4]
4. Volume charge density is located in free space as $\rho_v = 2e^{-1000r}$ nC/m^3 for $0 < r < 1$ mm, and $\rho_v = 0$ elsewhere. (a) Find the total charge enclosed by the spherical surface $r = 1$ mm. (b) By using Gauss's law, calculate the value of D_r on the surface $r = 1$ mm. [4m CO-3]
5. What are the boundary conditions for electric field and magnetic field intensities at the interface between two dielectric materials? Explain in detail with proper mathematical equations. [4m CO-3]
6. Define the following [4m CO-5]
   a. Phase constant and attenuation constant
   b. Impedance Matching
   c. Telegrapher's equations
   d. TE and TM waves