JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-V Semester (ECE)

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

COURSE NAME: Electromagnetic Waves

COURSE INSTRUCTORS:Dr. Salman Raju Talluri MAX. TIME: 2 Hours

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Note: (a)All questions are compulsory.

(b)Each question carries five marks

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

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1. What are the basic fundamental electrical parameters of an antenna? What will be the length of a half-wave length dipole antenna if the operating frequency is 5 GHz? [CO-5]
2. 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 other modes. (c) What is the cutoff frequency for TM_{11} mode. [CO-5]
3. Derive the equations for reflection and transmission coefficients of Electric filed intensity for normal incident between two media by specifying boundary conditions at the interface. Assume that the wave is propagating in +z direction and media 1 is present for z<0 and media 2 for z>0. [CO-4]
4. An elected filed intensity in free space is given by $E(z,t) = 20\cos(2 \times \pi \times 10^8 t - 0.5z)a_x\ \mu V/m$. Specify the direction of propagation, wavelength and phase constant. Find the associated magnetic field intensity as well. [CO-4]
5. Write the Maxwell's equation in point form and integral form. Specify the significance of each equation. [CO-2]
6. A load impedance of $Z_L = 100 - j50\ \Omega$ is connected to a transmission line of characteristic impedance $Z_0 = 50\ \Omega$ of 1.2λ length. Using Smith Chart, find the reflection coefficient, VSWR, return loss and the distance of the first minima from the load towards the generator. Find the input impedance of the line at a distance of $\lambda/4$ from the load towards generator. [CO-4]
7. Write in brief about the following. [CO-5]
    a. Evanescent Modes
    b. Impedance matching
    c. Guided wavelength and free space wavelength
    d. Laplace equation
    e. Intrinsic impedance