JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- DECEMBER 2021

B. Tech 5th Semester

COURSE CODE:17B11EC411                                          MAX. MARKS: 35

COURSE NAME: Electromagnetic Engineering

COURSE CREDITS: 4                                               MAX. TIME: 2 Hrs

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

1. Derive the expressions for near and far field components of Hertz dipole? Calculate the radiation resistance and total power radiated by this antenna. [CO-4, 5; 5 Marks]

2. Derive the expressions of electric and magnetic fields components for TE modes in rectangular waveguides. Does TEM mode exist in rectangular waveguide? [CO-3, 4; 5 Marks]

3. An air-filled circular waveguide has a radius of 2 cm and is to carry energy at a frequency of 10 GHz. Find all the $TE_{np}$ and $TM_{np}$ for which energy transmission is possible. [CO-4; 5 Marks]

4. An air-filled RWG of inside dimensions 7*3.5 cm operates in the dominant mode:
   (a) Find the cut-off frequency.
   (b) Determine the phase velocity of the wave in the guide of 3.5 GHz.
   (c) Determine the guided wavelength at the same frequency. [CO-3, 4; 5 Marks]

5. Calculate the ratio of circular waveguide cross-sectional area to rectangular waveguide cross-section. Assuming that both these waveguides have similar or equal cut-off frequencies or wavelength for TE modes. [CO-4, 5; 5 Marks]

6. Show by a suitable diagram the behaviour of electric and magnetic fields in a rectangular waveguide for dominant mode. [CO-2, 3; 5 Marks]

7. Write the boundary conditions for the electric fields at the interface separating:
   (a) Dielectric and dielectric.
   (b) Conductor and dielectric
   (c) Conductor and free space. [CO-1, 2; 5 Marks]