

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- DECEMBER 2021

B. Tech 5th Semester

COURSE CODE:18B11EC513

MAX. MARKS: 35

COURSE NAME: Electromagnetic Waves

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]