

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- Sep 2018

B.Tech 5th Semester

COURSE CODE: 17B11EC512

MAX. MARKS: 15

COURSE NAME: Microwave Devices & Antenna Design

COURSE CREDITS: 4

MAX. TIME: One Hr

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

1. At 15 GHz, an air-filled $5\text{cm} \times 2\text{cm}$ rectangular waveguide placed with its axis along z-direction has :

$$E_z = E_{0z} \sin(40\pi x) \sin(50\pi y) e^{-j\beta_g z} V/m$$

Calculate the mode of propagation.

[CO-1; 2 Marks]

2. Show the top view and side view of the behaviour of electric and magnetic fields with in a rectangular waveguide for dominant mode. [CO-1; 2 Marks]
3. Explain why TEM mode does not exist in rectangular waveguides but exists in parallel plane waveguides? [CO-1,2 ; 2 Marks]
4. Derive the expressions of Electric and Magnetic field components for TE mode in circular waveguide. [CO-1; 5 Marks]
5. The cross section of a rectangular waveguide is $20\text{cm} \times 5\text{cm}$. Find six lowest order modes which will propagate in the waveguide and their cut-off frequencies. [CO-2; 2 Marks]
6. A TE_{11} mode is propagating through a circular waveguide. The radius of the guide is 5 cm, and the guide contains an air-dielectric:
- (a) Determine the cut-off frequency.
- (b) Determine the wavelength λ_g in the guide for an operating frequency of 3 GHz.
- (c) Determine the wave impedance Z_g in the guide. [CO-2; 2 Marks]