Graphic Era
HILL UNIVERSITY
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University under section 2(f) of UGC Act, 1956

Mid Term Evaluation (Even) Semester Examination March 2025

Roll no...........................

Name of the Course: B.Tech
Semester: VI
Name of the Paper: Microwave Engineering
Paper Code: TEC 601
Time: 1.5 hour   **Maximum Marks: 50**

Note:
- (i) Answer all the questions by choosing any one of the sub-questions
- (ii) Each question carries 10 marks.

Q1.   (10 Marks)   CO: 1
- a. Derive the field equations for rectangular waveguide in TE mode.

OR

- b. An air-filled rectangular waveguide of inside dimensions 7 x 3.5 cm operates in the dominant TE10 mode. (i) Find the cut off frequency, (ii) Determine the phase velocity of wave in the guide at a frequency of 3.5 GHz, (iii) Determine the wavelength at the same frequency.

Q2.   (10 Marks)   CO: 1
- a. Explain dominant mode, evanescent mode and degenerate modes.

OR

- b. A rectangular is designed to propagate the dominant mode TE10 at the frequency of 5 GHz and the cutoff frequency is 80% of the signal frequency. The time average power flowing through the guide is 1 KW. Find the magnitude of E and H in the waveguide.

Q3.   (10 Marks)   CO: 1,2
- a. Sketch the electric and magnetic field configuration for $[TE]\_10$ mode and $[TE]\_20$ mode in a rectangular waveguide.

OR

- b. Fourport circulator is realized by two magic tees and phase shifter producing the phase shift of 180 deg. Explain the working of the circuit. Also write the S-matrix of the circuit.

Q4.   (10 Marks)   CO: 2
- a. Explain the following parameters used to characterize a directional coupler: (i) Coupling coefficient, (ii) Directivity, (iii) Isolation

OR

- b. Explain the Hybrid Ring and write the scattering matrix for the four port hybrid ring.

Q5.   (10 Marks)   CO: 2
- a. What is excitation of a wave guide? Explain different methods.

OR

- b. Guided wavelength of a rectangle waveguide (2.286cm x 1.016cm) is 4.42cm. When the waveguide is short circuited, find the operating frequency of microwave source (considering it is operating in dominant mode).