

T. E. (Electronics) (Sem VI) (Rev) 21/5/07  
 microwave & optic fiber communication

(REVISED COURSE)

ND-8093

(3 Hours)

[ Total Marks : 100

- N.B. (1) Question No. 1 is compulsory.  
 (2) Attempt any four questions from the remaining six questions.  
 (3) Assume suitable data if necessary.

1. Answer any four :— 20
- Are TEM waves possible in circular waveguide? Justify your answer.
  - Differentiate between TE and TM modes in a rectangular waveguide. Why is  $TM_{01}$  Or  $TM_{10}$  mode not possible in a rectangular waveguide?
  - What is Velocity Modulation? How Velocity Modulation is utilised in Klystron amplifier?
  - Explain intermodal dispersion in Optical Fiber System.
  - Compare between LED and LASER diode.
2. (a) Explain with a suitable sketch the Mechanism of Propagation of an E-M wave through a rectangular waveguide. 8
- (b) Give the reason why there are different modes of propagation and a cutoff freq. for a particular waveguide having definite geometry. 4
- (c) What is the dominant mode? What are the phase velocity and the group velocity of an E - M wave in a waveguide? Explain. 8
3. (a) What are cross field devices? How does a magnetron sustain its oscillations using this crossfield? Assume  $\pi$  mode for explaining the same. 10
- (b) A two Cavity Klystron is operated at 10 GHz with  $V_0 = 1200$  V,  $I_0 = 30$  mA,  $d = 1$  mm,  $L = 4$  m and  $R_{sh} = 40$  K $\Omega$  neglecting beam loading, Calculate — 10
- Input RF voltage V, for a maximum output voltage
  - Voltage gain
  - Efficiency.
4. (a) In a H-plane Tee junction 20 mW power is applied to Port (1) that is perfectly matched to the junction. Calculate the power delivered to the load 60  $\Omega$  and 75  $\Omega$  connected to Port (1) and Port (2). 5
- (b) What is a directional coupler? What are its characteristics? 5
- (c) Differentiate between — 10
- TWTA and Klystron
  - IMPATT diode and Gunn diode.
5. (a) Describe different types of modes that are supported by an optical fiber. What is the significance of cutoff no. of fiber? 8
- (b) With the help of neat block diagram. Explain the major elements of an optical fiber transmission link. 8
- (c) Calculate the cross sectional area of a multimode stepindex fiber with a V no.,  $V = 100$  and a N.A. = 0.30. This fiber will be used in a data link with a 0.82  $\mu$ m LED. 4  
 (Take  $n_1 = 1.458$ )
6. (a) Distinguish between Spontaneous Emission and Stimulated Emission. 5
- (b) Explain splices and connections in optical fibers. 5
- (c) Explain any one method of measuring each of the following :— 10
- Dispersion in optical fiber
  - Attenuation in optical fiber.
7. Write short notes on any four :— 20
- Magic Tee
  - S-matrix
  - Cavity resonators
  - Link power budget
  - Modes in optical waveguides.