(3) Assume any **suitable** data whenever required but justify the **same**.

1. Answer any **four** from the following :—   20
   - (a) Why a Hybrid E-H plane Tee referred an Magic Tee ?
   - (b) Find the Cutoff frequency of a rectangular waveguide filled with air, having inside dimensions 7 x 3·5 cm for TE_{10} mode.
   - (c) Discuss in brief the methods of tuning a cavity resonator.
   - (d) Differentiate between spontaneous and stimulated emission of radiation.
   - (e) What are the advantages and drawbacks of LEDS in comparison with the injection lasers for use as a source in optical fiber communication ?

2. (a) What are waveguides ? Explain the following terms with suitable illustration related   10 to waveguide.
     - (i) Degenerative mode
     - (ii) Dominant mode
     - (iii) Waveguide excitation
     - (iv) Characteristic Equation.
   - (b) Explain with a suitable sketch the mechanism of propagation of an E-M wave through   10 a rectangular waveguide and derive an expression for boundary conditions required to arrive at the expression for Hz in rectangular waveguide.

3. (a) With the help of Applegate diagram explain the operation of Reflex Klystron, show   10 that the theoretical efficiency of the Reflex Klystron is 27·7 %.
   - (b) Explain the working of a two hole directional coupler. Define directivity and coupling   10 factor for the same.

4. (a) What are S-parameters used to analyze microwave circuits ? Define the S-parameters   10 and obtain the same for an E-plane Tee.
   - (b) What are crossed field devices ? How does a magnetron sustain its oscillations   10 using cross field ? Assume π mode for explaining the same.

5. (a) Classify the fibers based on modes of propagation and index profile. Draw Index   10 profile of various types of fiber and enumerate their application.
   - (b) What is the significance of numerical aperture of an optical fiber ? Obtain the   5 expression for the numerical aperture of an optical fiber.
   - (c) An optical fiber has refractive index of 1·6 for the core and 1·4 for the cladding.   5 Calculate the following :
     - (i) Critical Angle
     - (ii) Numerical aperture
     - (iii) Maximum angle of acceptance.

6. (a) Describe the technique for measurement of dispersion in fiber.   5
   - (b) Describe different types of modes that are supported by an optical fiber. What is   10 the significance of cut-off number of fiber ?
   - (c) Describe optical link power budget in brief.   5

7. Write short notes on any **four** :—   20
   - (a) TWT (Travelling Wave Tube)
   - (b) Splices and connectors in optical fiber
   - (c) TRAPATT diode
   - (d) Measurement of microwave power
   - (e) Dispersion mechanisms in optical fiber.

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