8E4090

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B.Tech. VIII Semester (Old Back) Examination, April/May 2016

Electronics and Communication

8EC3 (O) Optical Communication

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions. Selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.)*

Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) Explain and classify the fiber and compare single mode with multimode step index and graded index fiber **(8)**

   b) A multimode step index fiber is operating at a wave length of 0.85 μm with a core diameter is 80 μm and a relative index difference of 15% if the refractive index of core is 1.48 determine

      i) The normalized frequency for the fiber **(4)**

      ii) The number of guided mode **(4)**

OR

1. a) What is dispersion. Explain dispersion shifted and flattened fibers with neat diagram **(8)**

   b) List the different types of materials use for manufacturing of fiber. Explain modified chemical vapour. Deposition (MCVD) process for optical fiber manufacturing. **(8)**

Unit - II

2. a) Describe the common LED structure for optical fiber communication. In particular compass surface and edge emitting devices **(8)**

   b) What is LASER? Explain the working principle of an injection semiconductor LASER with neat diagram **(8)**

OR

2. a) What are direct and indirect band gap materials? Explain and which one is used for LED and why? **(8)**

   b) A ruby LASER contains a crystal length 4 cm with a refractive index of 1.78. The peak emission wavelength from the device is 0.55 μm . Determine the number of longitudinal modes and their frequency separation

Unit - III

3. a) Explain the physical principle of PIN photo detector using schematic circuit diagram. Also explain the operation of RAPD

   b) A P-N photodiode has a quantum efficiency 50% at a wavelength of 0.9 μ m calculate

      i) Its responsivity at 0.9 μm **(2)**

      ii) The received optical power if the mean photo current is 10^{-6}A **(3)**

      iii) The corresponding number of received photons at this wavelength **(3)**

OR

3. a) Explain the various different types of noises in optical detectors **(8)**

   b) What are the important characteristics of an optical receiver. Explain different types of optical receiver use in optical communication **(8)**

Unit - IV

4. a) What is meant by splicing? Explain different types of splices and compare with the connectors **(8)**

   b) A 80/125 μm graded index (GI) fiber with a NA of 0.25 and α of 2.0 is jointed with 60/125 μm GI fiber with an NA of 0.21 and α of 1.9. The fiber axes are perfectly aligned and there is no air gap. Calculate the insertion loss at a joint for the signal transmission in the forward and backward directions. **(8)**

OR

4. a) Explain the link design for optical communication system. Give brief description of the losses to be counted in link design **(8)**

   b) Describe the Wavelength Devisions Multiplexing (WDM) use in optical fiber communication. **(8)**

Unit - V

5. a) Explain the measurement of retractive index profile parameter of fiber with neat diagram **(8)**

   b) A 2km length of multimode fiber is attached to apparatus for spectral loss measurement. The measured output voltage from the photoreceiver using the full 2km fiber length is 21.V at a wavelength of 0.85 μm. When the fiber is then cut back to leave a 2m length the output voltage increases to 10.7v. Determine the attenuation per kilometer for the fiber at a wavelength of 0.85 μm **(8)**

OR

5. a) What is Optical Time Domain Reflectometry(OTDR)? Explain the principle and measurement technique with neat diagram **(8)**

   b) Discuss with the aid of suitable diagram the measurement of scattering losses in optical fibers. **(8)**