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6E 6058

B.Tech. VI Semester (Main) Examination, May-June 2015
Electronics and Communication Engg.
6EC6.3A Optical Fiber 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) What are the functions of the core and cladding in an optical fiber? Why should their refractive indices be different? would it be possible for the light to be guided without cladding **(8)**

   b) A multimode step index fiber with a core diameter of 80 μ m and a relative index difference of 1.5% is operating at a wavelength of 0.85 μ m. If the core refractive index is 1.48, estimate

      i) The normalized frequency for fiber

      ii) The number of guided modes **(4+4)**

OR

1. a) What is dispersion? Explain dispersion shifted and dispersion flattened fiber with their applications **(8)**

   b) List the major advantages of vapour phase deposition in the preparation of glasses for optical fiber. Explain outside vapour phase oxidation (OVPO) process **(4+4)**

Unit - II

2. a) Compare the properties of laser diode and LED's used for optical communication. **(8)**

b) The radiative and nonradiative recombination lifetimes of the minority carriers in the active region of a double heterojunction LED are 60 ns and 100 ns respectively. Determine the total carries recombination lifetime **(8)**

OR

2. a) Describe the common LED structures for optical fiber communication discussing their relative merits and drawbacks **(8)**

b) What is population inversion? Explain threshold condition for laser oscillation **(4+4)**

Unit - III

3. a) Explain the detection principle of PIN photodiode and compare it with avalanche photodiode(APD). **(8)**

b) A 80/125 μm graded-index(GI) fiber with a NA of 0.25 and α of 2.0 is jointed with a 60/125 μm GI fiber with an NA of 0.21 and α of 1.9. The axes are perfectly aligned and there is no air gap. Calculate the insertion loss at a joint for the signal transmission in forward and backward directions. **(5+3)**

OR

3. a) What is splicing in fiber? Explain different types of techniques use for splicing the optical fiber with neat diagram **(2+6)**

b) A P-N photo diode has a quantum efficiency of 50% at a wave length of 0.9 μm calculate

i) Its responsivity at 0.9 μm

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

iii) The corresponding number of received photons at this wavelength **(2+3+3)**

Unit - IV

4. a) Explain the working principle of optical time domain reflectometry (OTDR) with neat diagram and its application in optical communication **(8)**

b) A 2 Km length of multimode fiber is attached to apparatus for spectral loss measurement. The measured output voltage from the photo receiver using the full 2Km fiber length is 2.1 V at a wavelength of 0.85 μm. When the fiber is than cutback to leave a 2m length the output voltage increases to 10.7V. determine the attenuation per kilometer for the fiber. **(8)**

OR

4. a) Explain the time domain technique for dispersion measurement **(8)**

   b) Describe the measurement technique for numerical apperture(NA) in optical fiber **(8)**

Unit - V

5. a) List the different types of application of optical fiber communication in daily life **(8)**

   b) Explain the mach-Zehnder interferometric sensor for fiber optic **(8)**

OR

5. a) Describe wavelength division multiplexing use in optical communication **(8)**

   b) Write short note on optical amplifiers use in optical communication **(8)**
