[6010]-70

B.E. (E & TC) (Insem)
FIBER OPTIC COMMUNICATION
(2019 Pattern) (Semester - VIII) (404190)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates :

1) *Answer Q.1 or Q.2, Q.3 or Q.4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) Using simple ray theory, describe the mechanism for the transmission of light within an optical fiber. With the help of suitable diagram discuss what is meant by the acceptance angle and numerical aperture of the fiber. **[5]**

b) A manufacturer wishes to make a silica-core, step-index fiber with $V = 75$ and a numerical aperture $NA = 0.30$ to be used at 820 nm. If n1 = 1.458. What should the core size and cladding refractive index be? **[5]**

c) Describe with the aid of simple ray diagrams. the MMSI and SMSI fiber. Compare advantages and disadvantages of these two types of fibers. **[5]**

OR

Q2) a) Explain the key elements of the optical fiber communication system with neat diagram and identify the three transmission windows on the fiber attenuation curve. **[6]**

b) The mean optical power launched into an optical fiber link is 1,5 mW and the fiber has an attenuation of 0.5dB/Km. Determine the maximum possible link length without repeaters when the minimum mean optical power level required at the detector is 2μW. **[4]**

c) Classify and explain the various loss mechanisms in optical fibers. **[5]**

P.T.O.

Q3) a) 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 carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is 0.87 μm at a drive current of 40 mA. **[6]**

b) Describe with the help of suitable diagram the mechanism giving the emission of light from an LED. State useful properties of LED to be used in optical fiber communication. **[5]**

c) State the semiconductor materials used for various optical sources. **[4]**

OR

Q4) a) Explain the following terms **[5]**

   i) Absorption

   ii) Spontaneous Emission

   iii) Stimulated Emission

b) Compare LED with LASER w.r.t. following points: **[5]**

   i) Output Power

   ii) Spectral width

   iii) Coupled Power

   iv) E/O efficiency

   v) Speed

c) A GaAs laser operating at 900nm has a 300μm length and refractive index n=4.3. Find the following **[5]**

   i) Frequency spacing

   ii) Wavelength spacing

   iii) Number of modes

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