B.E. Electronics & Telecommunication / Communication Engineering Seven Semester (CBS)

EC703 - Opto Electronics Devices and Communication

P. Pages : 2 **GUG/W/18/1794**

Time : Three Hours * 1 4 0 4 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Draw the block diagram of optical communication system. Give the advantages of optical communication as compared with microwave links. Mention disadvantages if any. **8**

b) Consider a fiber with 25 μm core radius. Core index $n_1 = 1.48$ and $\Delta = 0.01$ **8**

i) If $\lambda = 1320$ nm, what is the value of V and how many modes propagate in the fiber.
ii) What percent of optical power flows in the claddings ?

OR

2. a) Explain the terms : **8**

i) LP Modes ii) Hybrid modes
iii) Degenerate modes iv) Leaky modes

b) Prove that for step index fiber a mode remains guided when **8**
$n_2 k < \beta < n_1 k$
where, symbols have their usual meaning.

3. a) What are the different types of attenuation losses in optical fiber ? Explain in brief. **8**

b) What is pulse broadening in optical fiber ? Explain how it is related with group delay ? Derive necessary relationship. **8**

OR

4. a) A certain optical fiber has attenuation of 1.4 dB/km at 1200 nm. If 0.5 mW of optical power is initially launched into the fiber, what is the power level in microwatt after 7 km and 15 km ? **8**

b) Define a connector. What are basic requirements of connector ? Discuss different types of connectors. **8**

5. a) Discuss absorption, spontaneous emission and stimulated emission process of LASERs in detail. **8**

b) A lens coupled surface emitting LED launches 600 microwatt of optical power into a step index fiber. Determine the overall power conversion efficiency if it is operating with a drive current of 100 mA and forward voltage of 1.9 V. If numerical aperture is 1.5 estimate the coupling efficiency and optical losses in dB. **8**

OR

6.	a)	Draw the schematic of edge-emitting LED and explain its working.	**8**
	b)	What are direct band gap materials ? Explain why direct band gap materials are suitable for manufacturing of optical sources.	**8**
7.	a)	Discuss the basic requirement of photo detector. Define quantum efficiency and responsivity of photo detectors and obtain the relation between them.	**8**
	b)	A given Si avalanche photodiode has a quantum efficiency of 65% at a wavelength of 900 nm. Suppose 0.6 μw of optical power produces a multiplied photo current of 10A. Find the multiplication factor M.	**8**

OR

8.	a)	Draw the schematic diagram of optical receiver and explain its working. Explain the various noise sources in the optical receiver.	**8**
	b)	Explain the working principle of an avalanche photodiode. Draw its equivalent circuit.	**8**
9.	a)	Describe with the aid of block diagram the working of WDM system.	**8**
	b)	Explain backscatter method of fiber attenuation measurement. Compare this method with cutback method of attenuation measurement.	**8**

OR

10. Write short notes on : **16**

i) SONET

ii) Eye pattern technique

iii) RZ, NRZ codes

iv) LAN configuration using fiber optics.

****