EC703 - Opto Electronics Devices And Communication

P. Pages : 2

GUG/S/19/1794

Time : Three Hours

1389

Max. Marks : 80

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Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Define numerical aperture. Derive expression for NA for SI & GI fiber. **8**

b) Describe with the help of neat diagram single mode step index fiber & multimode step index fiber. **8**

OR

2. a) Differentiate between

i) Step index & graded index fiber. **4**

ii) Skew rays & meridional rays. **4**

b) Using ray theory. Discuss transmission of light through graded index fiber. **8**

3. a) Explain the techniques used for splicing. **8**

b) A continuous 12km long optical fiber link has a loss of 1.5dB/km. **8**
i) What is the minimum optical power level that must be launched into the fiber to maintain an optical power level of $0.3\mu w$ at the receiving end.
ii) What is the required input power if the fiber has a loss of 2.5dB/km

OR

4. a) What is dispersion in optical fibers and why does it occur? **8**

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

5. a) What are direct and indirect band gap materials? Explain why direct band gap materials are suitable for manufacturing of optical sources? **8**

b) Explain the threshold condition for oscillations in cavity lasers. **8**

OR

6. a) Differentiate between

i) LED & LASER. **4**

ii) Surface emitter LED & Edge emitter LED. **4**

b)	i)	Give the different lensing schemes far coupling improvement.	**4**
	ii)	GaAs has the energy gap 1.43eV Estimate the wavelength of emitted photon in LED for which spectral density is maximum at room temperature. Boltzmann's constant $= k = 8.62 \times 10^{-5} \, eV$.	**4**

7. a) Draw a schematic diagram of a typical optical receiver and explain its working. **8**

b) Define the terms quantum efficiency and responsivity of a photodetector. Obtain the relationship between them. **8**

OR

8. a) Explain the working principle of an APD. Draw its equivalent circuit. **8**

b) i) In a 100ns pulse, 6×10^6 photons at a wavelength of 1300nm fall on a GaAs photo-detector. on an average 3.9×10^6 electrons-holes are generated. Find out quantum efficiency. **4**

ii) A Si P – I – N photodiode has a quantum efficiency of 0.7 at a wavelength of $0.85 \, \mu m$. Calculate its responsivity. **4**

9. Write short note on:
i) WDM **4**
ii) SONET **4**
iii) OTDR **4**
iv) Active T – Coupler. **4**

OR

10. Describe the cut back method for measuring total transmission loss of fiber link. Explain why it is necessary to match the spot size and numerical aperture of the incident beam and the fiber. **16**

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