

**Q.2 a. Draw the functional block diagram of an optical fiber communication system. Mark the component typical to OFC. List the merits, demerits and applications of optical fibers.**

**b. Calculate the cut off parameter and the number of modes supported by a fiber with core Refractive Index 1.54 and cladding is 1.5, Core has a radius of 25 $\mu$ m and operates at 1300nm.**

Ans 2(a)(b). Gerd Keiser , 3<sup>rd</sup> Edition, Chapter-I title (1.3) Element of an optical Fiber Transmission link

**Q.3 a. Briefly explains the reasons for pulse Broadening due to material dispersion in optical fibre. (8)**

**b. Define the following terms: (3+3+2)**

**(i) Scattering losses in optical fibers**

**(ii) Mode Coupling**

**(iii) Bending losses**

Ans. 3(a)(b) Gerd Keiser , 3<sup>rd</sup> Edition pulse Broadening due to material dispersion (3.2.3) (3.1.3) (3.4) (3.1.4)(3.5.5)

**Q.4 a. Explain the principle and operation of a photo detector. List the requirements of a good optical source.**

**b. Photon energy of  $1.5 \times 10^{-19}$  J is incident on a photodiode, having a quantum efficiency of 85%. Calculate the wavelength at which the diode is operational and the incident optical power to obtain a photocurrent of 5 $\mu$ Amp.**

**c. Discuss the factors responsible for limiting the speed of response of photodiode. (4)**

Ans. 4(a)/(b): (6.1.1) principles of photo diodes  
4(c): (6.3.2) (Pg No.289) Response Time

**Q.5a.(i) With neat sketches, discuss the mechanical misalignments which occurs between two fibers.**

**(ii) Suggest 5 possible lens schemes used to improve source of fiber coupling efficiency. (8)**

**b. What are optical fiber connectors? Discuss some principal requirements for a good connector design**

Ans : Chapter-5(a) (i) 5.3.1; 5.2 , a-(ii) ;  
(b) 5.6.1 Optical fiber connector

**Q.6a. What is an optical preamplifier? Derive an equation for the signal to noise ratio at the output of an optical preamplifier.**

**b. For an optical receiver show that at least 27 photons/bits are required to maintain BER  $\leq 10^{-12}$  (8)**

Ans. Chapter-7, Topic(7.4) & 7.5, Page no. 312

**Q.7 a. Discuss the cause and effect of signal degrading effects in optical fibers.**

*Q.7 a. Cause and effects of signal degrading effects in optical fibers.*

<i>Attenuation</i>	<i>Scattering</i>	<i>(08)</i>
<i>Bending</i>	<i>Coupler etc</i>	
<i>Dispersion</i>		

Ans.

**b. Define quantum efficiency and responsivity of optical detectors. Find these quantities in an optical detector at  $0.85\mu\text{m}$ , when  $3 \times 10^{11}$  electrons.**

Ans. Chapter 6 of Text Book

**Q.8 a. Explain the following terms in context with point-to-point links for Digital Transmission:-**

- (i) Link Power Budget
- (ii) Rise Time Budget
- (iii) Short Wavelength Band

**b. Enlist all the techniques employed for correction and detection purpose. Explain one for each.**

Ans(a)/(b): Chapter 8 Digital transmission system. 8.1 (8.1.2 & 8.1.3)/ 8.2 & 8.3.

**Q.9 a. Briefly explain the four sub layers of SONET. (8)**

**b. Define WDM? With the help of Schematic diagram, explain the operational principles of WDM.**

Ans (a)/ (b) - Chapter-12 Topic 12.2. Operational Principle of WDM No. 10.1. Page no.380

### Text book

- I. **Optical Fiber Communications, Gerd Keiser, 3rd Edition, McGraw Hill Publications, 2000**