19 DEC 2022

Reg. No.													

Question Paper Code	11481

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Seventh Semester

Electronics and Communication Engineering

EC8751 - OPTICAL COMMUNICATION

(Regulations 2017)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Why the refractive index of core is to be higher than cladding index?	2,K2,CO1
2.	State few advantages of graded index fiber.	2,K2,CO1
3.	Calculate the power received at the distance of 25 Km if the fiber has an attenuation of 0.5 dB/Km and the initial power launched is 0.5mW.	2,K2,CO2
4.	State the causes of dispersion.	2,K2,CO2
5.	State the reason: The indirect band gap material is preferred for optical sources.	2,K2,CO3
6.	Find the peak emission wavelength of an LED made from semiconductor whose bandgap energy is 0.7 eV.	2,K2,CO3
7.	Mention few parameters to measure optical receiver performance.	2,K2,CO4
8.	List the issues faced while splicing fibers.	2,K2,CO4
9.	State few components required to implement an optical network.	2,K2,CO5
10.	Draw the block diagram of an optical receiver.	2,K2,CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) A manufacturing engineer wants to make an optical fiber that has a core index of 1.48 and cladding index of 1.49. Identify the core size for single mode operation at 1550 nm.	5,K2,CO1
		(ii) Explain ray theory transmission in optical fibers and derive numerical aperture and critical angle.	8,K2,CO1
		OR	
	b)	(i) Determine the numerical aperture of the fiber whose core index is 1.5 and cladding index is 1.47.	3,K2,CO1
		(ii) Explain the mode propagation theory in cylindrical optical fiber through Maxwell's equations.	10,K2,CO1
12.	a)	(i) 150 μW optical power is launched at the input of a 10 Km long optical fiber operating at the wavelength of 850 nm. The output power available is 5μW. Estimate the total attenuation in dB over the	5,K2,CO2

link length neglecting all connector and splice losses. Evaluate the average attenuation per Km.

(ii) Explain the causes for microscopic and macroscopic bending losses in optical fiber. What is critical radius of curvature? 8,K2,CO2

OR

b) (i) Explain the factors contributing to attenuation in optical fibers. 10,K2,CO2

(ii) Draw the graph for attenuation in optical fibers as a function of wavelength. 3,K2,CO2

13. a) Draw and explain the structure of Fabry Perot resonator cavity for a LASER diode. Derive LASER diode rate equation. 13,K2,CO2

OR

b) (i) Describe the characteristics required for an optical source. 3,K2,CO3

(ii) Compose the different types of noise affecting the performance of a photo detector and derive an expression for the signal to noise ratio. 10,K2,CO3

14. a) Explain

(i) Fiber refractive index profile measurement. 7,K2,CO4

(ii) Fiber cutoff wavelength measurement. 6,K2,CO4

OR

b) (i) Elaborate in detail about various fiber splicing techniques. 7,K2,CO4

(ii) Explain any one lensing scheme to improve the power coupling efficiency. 6,K2,CO4

15. a) Describe SONET frame structure and SONET network topology with appropriate diagrams. 13,K2,CO5

OR

b) Enumerate the salient feature of solitons using relevant expressions and diagrams. 13,K2,CO5

PART - C (1 × 15 = 15 Marks)

16. a) A multimode graded index fiber exhibits total pulse broadening of 0.1μs over a distance of 15km. 15,K3,CO2

Estimate:

(i)The maximum possible bandwidth on the link assuming no Inter Symbol Interference;

(ii)The pulse dispersion per unit length;

(iii)The bandwidth length product for the fiber.

OR

b) (i) Compare LED and LASER source. 5,K3,CO2

(ii) Differentiate Avalanche and PIN photo detector. 2,K3,CO2

(iii) Compare step index and graded index fiber. 5,K3,CO2

(iv) As a design engineer for optical communication set-up. Which source, fiber and detector will you opt to establish a good link. 3,K3,CO2