Reg. No.												

Question Paper Code	12179

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Seventh Semester

Electronics and Communication Engineering

20ECPC702 - OPTICAL COMMUNICATION

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	What is a Linearly Polarized Mode?	*2,K2,CO1*
2.	The refractive indexes of the Core and Cladding of a silica fiber are 1.48 and 1.46 respectively. Find the acceptance angle for the fiber.	*2,K2,CO1*
3.	A fiber has an attenuation of 0.5dB/km at 1500nm.If 0.5mW of optical power is initially launched into the fiber, estimate the power level after 25km.	*2,K1,CO2*
4.	What is polarization mode dispersion?	*2,K1,CO2*
5.	Find the peak emission wavelength of an LED made from semiconductor whose band gap energy is 0.7 eV.	*2,K1,CO3*
6.	Define external Quantum Efficiency.	*2,K1,CO3*
7.	Define BER.	*2,K1,CO4*
8.	Why do we prefer trans-impedance preamplifier rather than high impedance preamplifier?	*2,K1,CO4*
9.	State the concept of WDM.	*2,K1,CO5*
10.	Define the basic signal rate of SONET.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A fiber has Core radius of 25μm, core refractive index of 1.48 and relative index difference (Δ)is 0.01. If the operating wavelength is 0.84μm, find the values of normalized frequency and the number of guided modes. Determine the number of guided modes if Δ is reduced to 0.003.	*13,K2,CO1*
		OR	
	b)	Starting from Maxwell's equation, derive the expression of wave equation of an electromagnetic wave propagating through optical fiber.	*13,K2,CO1*
12.	a)	(i) Explain the factors contributing to attenuation in optical fiber.	*7,K2,CO2*
		(ii) Draw the graph for attenuation in optical fibers as a function of wavelength.	*6,K2,CO2*

OR

b) Derive the expression for material dispersion and waveguide dispersion and explain them. *13,K2,CO2*

13. a) Draw and explain Fabry Perot resonator cavity for a laser diode. Derive laser diode rate equation. *13,K2,CO3*

OR

b) Draw the structures of SLED and ELED and explain their principle of operation. *13,K2,CO3*

14. a) Compare the different types of noise affecting the performance of a photo detector and derive an expression for the signal to noise ratio. *13,K2,CO4*

OR

b) (i) What are factors that decide the detector response time? Explain them in detail with necessary sketches. *8,K2,CO4*

(ii) An APD generates a current of 100nA when the incident power is 5nW. The operating wavelength is 1.5 μm. Find its responsivity. If the quantum efficiency is 0.7, find the multiplication factor. *5,K2,CO4*

15. a) Explain in detail about various lensing schemes for coupling improvement. *13,K2,CO5*

OR

b) (i) Discuss with the aid of a suitable diagram the cut- back technique used for the measurement of the total attenuation in an optical fiber. Indicate the differences in the apparatus utilized for spectral loss and spot attenuation measurement. *7,K2,CO5*

(ii) A spot measurement of fiber attenuation is performed on a 1.5 km length of optical fiber at a wavelength of 1.1 μm. The measured optical output power from the 1.5 km length of fiber is 50.1 μW. When the fiber is cut back to a 2 m length, the measured optical power is 385.4 μW. Determine the attenuation per kilometer for the fiber at a wavelength of 1.1 μm. *6,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Explain the following requirements for the design of an optically amplified WDM link: (i) Link Band width (ii) Optical power requirements for a specific BER. *15,K3,CO6*

OR

b) Describe the rise-time budget in detail and Assume that LED together with drive circuit has a rise time of 15 ns. LED has a spectral width of 40 nm. We have a material dispersion related rise time degradation of 21 ns over the 6 km link. The rise time degradation from the receiver is 14 ns. The modal dispersion induced fiber rise time is 3.9 ns. Calculate link rise time. *15,K3,CO6*