Reg. No.															

Question Paper Code	13865

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Electronics and Communication Engineering

20ECPC702 - OPTICAL COMMUNICATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The Numerical Aperture (NA) of an optical fiber determines: (a) The refractive index of the cladding (b) The attenuation of the fiber (c) The light-gathering ability and acceptance angle of the fiber (d) The mode pattern inside the fiber	1	K1	CO1
2.	The number of modes supported by a Fiber depends on: (a) Wavelength and refractive indices (b) Core diameter (c) Numerical Aperture (d) All of the above	1	K1	CO1
3.	Rayleigh scattering losses vary as: (a) $1/\lambda^2$ (b) $1/\lambda^4$ (c) λ^2 (d) λ^4	1	K1	CO2
4.	Intermodal dispersion occurs in: (a) Multimode fibers (b) Single-mode fibers (c) Plastic fibers (d) None of these	1	K1	CO2
5.	Which of the following materials is suitable for a direct band gap LED? (a) Silicon (b) Gallium arsenide (c) Germanium (d) Silicon carbide	1	K1	CO3
6.	The threshold condition in a laser diode is when: (a) Optical gain equals internal loss (b) Current is zero (c) Photon energy equals band gap energy (d) Laser temperature is maximum	1	K1	CO3
7.	When the light increases, the reverse current in a photodiode_____. (a) Zero (b) decreases (c) increases (d) remain same	1	K1	CO4
8.	Compared to a high impedance amplifier, a trans-impedance amplifier provides all, but which of the following improvements? (a) Bandwidth (b) Dynamic range (c) Sensitivity (d) Any of these answers	1	K1	CO4
9.	OTDR is mainly used to: (a) Measure quantum efficiency of a photodiode (b) Locate faults and measure attenuation along the fiber (c) Measure numerical aperture (d) Launch light efficiently into single-mode fibers	1	K1	CO5
10.	A major benefit of all-optical networks is: (a) Reduced signal attenuation (b) High-speed transmission without electronic bottlenecks (c) Lower fiber core diameter (d) Reduced quantum efficiency	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Justify the statement: "Light travels faster in cladding than core.	2	K2	CO1
12.	Mention the characteristics of graded index fiber.	2	K1	CO1
13.	Why scattering losses occurs more in multimode fibers?	2	K2	CO2
14.	Compare Intrinsic and Extrinsic Absorption.	2	K2	CO2
15.	Explain the resonant frequencies of a Laser Diode.	2	K2	CO3

16.	Explain the functions of quantum efficiency.		*2*	*K2*	*CO3*
17.	What are the different error sources in fiber optical receiver?		*2*	*K1*	*CO4*
18.	Define BER.		*2*	*K1*	*CO4*
19.	Differentiate the splicer and connector.		*2*	*K2*	*CO5*
20.	Mention the techniques used for determination of fiber numerical aperture.		*2*	*K1*	*CO5*
21.	Give the significance of solitons.		*2*	*K1*	*CO6*
22.	A fiber has attenuation of 0.2 dB/km over 25 km. Connector and splice losses are 3 dB. If the transmitter power is 0 dBm, calculate the received power.		*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	(i)	Calculate the numerical apertures of (i) A plastic step-index fiber having a core refractive index of n_1=1.60 and a cladding index of n_2=1.49. (ii) A step-index fiber having a silica core (n_1=1.458) and the silicone resin cladding (n_2=1.405).	*8*	*K2*	*CO1*
		(ii)	What is the maximum entrance angle $\theta_{0,max}$for the given plastic step index fiber with n_1=1.60 and n_2=1.49 when the outer medium is air.	*3*	*K2*	*CO1*
			OR			
	b)		Explain ray theory transmission in an optical communication with neat diagram. Explain acceptance angle, numerical aperture and total internal reflection using Snell's law with relevant figures and calculations.	*11*	*K2*	*CO1*
24.	a)	(i)	Contrast the relationship between Inter Symbol Interference (ISI) and Bandwidth in an optical fiber.	*6*	*K2*	*CO2*
		(ii)	Explain about bending losses in optical fiber and how they can minimize.	*5*	*K2*	*CO2*
			OR			
	b)		Analyze any three mechanisms of absorption in optical fiber.	*11*	*K2*	*CO2*
25.	a)		Draw the structures of SLED and ELED and explain their principle of operation.	*11*	*K2*	*CO3*
			OR			
	b)		Derive the expression for internal quantum efficiency, power and external quantum efficiency of LED.	*11*	*K2*	*CO3*
26.	a)		Draw the block diagrarn of fundamental optical receiver. Explain each block.	*11*	*K2*	*CO4*
			OR			
	b)		Illustrate the various measures of efficiency in PIN photodiode and briefly explain the working principle of PIN diode.	*11*	*K2*	*CO4*
27.	a)		Explain the working principle of an OTDR and how it is used to measure fiber attenuation.	*11*	*K2*	*CO5*
			OR			
	b)		What is meant by 'fiber splicing'? Explain various types of fiber splicing techniques and fiber connectors.	*11*	*K2*	*CO5*
28.	a)		Explain the basic structure of a SONET/SDH ring network.	*11*	*K2*	*CO6*
			OR			
	b)		Explain Link and Rise time budget with example.	*11*	*K2*	*CO6*