PVP 23

Code: 23EC4601B

III B.Tech - II Semester - Regular Examinations – APRIL 2026

OPTICAL COMMUNICATIONS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	What is Numerical Aperture of an optical fiber? Why is it important?	L2	CO1
1.b)	What are skew rays in an optical fiber? Explain briefly.	L2	CO1
1.c)	List any two advantages of optical fiber communication over copper cables.	L2	CO1
1.d)	Define Material Dispersion in optical fibers.	L2	CO2
1.e)	What is meant by bending loss in an optical fiber?	L2	CO2
1.f)	What are fiber splices? Mention any two types.	L2	CO3
1.g)	Define Wavelength Division Multiplexing (WDM).	L2	CO3
1.h)	What is the function of a Laser Diode in an optical communication system?	L2	CO4

1.i)	What is shot noise?	L2	CO5
1.j)	What is modal noise in optical communication receivers?	L2	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Define refractive index and Numerical aperture.	L2	CO1	5 M
	b)	A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine: i. the critical angle at the core–cladding interface ii. the NA for the fiber iii. the acceptance angle in air for the fiber.	L2	CO1	5 M
		OR			
3	a)	Draw the block diagram of optical fiber communication and explain each block.	L2	CO1	5 M
	b)	What is Total Internal Reflection and how to determine critical angle pictorially?	L2	CO1	5 M

UNIT-II					
4		Explain the different types of fiber materials used in optical fiber communication.	L3	CO2	10 M
OR					
5	a)	Discuss about core and cladding losses in optical fibers.	L3	CO2	5 M
	b)	Write a short note on intermodal dispersion.	L2	CO2	5 M
UNIT-III					
6	a)	Explain star couplers with a neat diagram.	L3	CO3	5 M
	b)	A 32 × 32 port multimode fiber transmissive star coupler has 1 mW of optical power launched into a single input port. The average measured optical power at each output port is 14 μW. Calculate the total loss incurred by the star coupler and the average insertion loss through the device.	L3	CO3	5 M
OR					
7		Explain the architecture of a WDM in optical communication system.	L4	CO3	10 M
UNIT-IV					
8		Explain the working principle of a Surface-Emitting LED (Light Emitting Diode) and explain any two LED characteristics.	L4	CO4	10 M
OR					

9	a)	Explain the laser diode characteristics and its operation.	L4	CO4	5 M
	b)	Explain the concept of carrier pair multiplication in Avalanche Photodiode.	L4	CO4	5 M
UNIT-V					
10	a)	Explain about Signal to Noise Ratio.	L4	CO5	5 M
	b)	Explain about thermal noise and laser noise.	L4	CO5	5 M
OR					
11	Explain Analog System Design parameters.		L4	CO5	10 M