VIT
Vellore Institute of Technology

SLOT: F2

Vellore – 632014, Tamil Nadu, India

SCHOOL OF ELECTRICAL ENGINEERING

FALL SEMESTER 2024-2025

CAT-1

Programme: B.Tech	**Branch: ECE, BML**	**Course code: BECE308 L**
Course Name: Optical Fiber Communications		**Date: 30/08/2024**
Class Nbr: VL2024250102781 VL2024250102786 VL2024250102783	**Max Marks: 50**	**Duration: 90 mins**
Faculty name(s): *Dr S Revathi, Dr A Jabeena & Dr A Sangeetha*		

General instruction(s): 1. Answer ALL

Q. No		Question	Marks	CO	BL
1	a	A multimode graded index fiber has an acceptance angle in air of 8°. Estimate the relative refractive index difference between the core axis and the cladding when the refractive index at the core axis is 1.52?	10	1	1
	b	A graded index fiber has a core with a parabolic refractive index profile which has a diameter of 62 μm. The fiber has a numerical aperture of 0.4. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1.31 μm?			
2.	a	Draw the optical band spectrum used for communication citing the range of wavelengths for different optical bands.	10	1	1
	b	What is a Polarization insensitive Fiber? Write the advantage and application of the same.			
3.	a	Distinguish intrinsic and extrinsic absorption losses in optical fibers.	10	2	2
	b	A continuous 40-km-long optical fiber link has a loss of 0.4 dB/ km. What is the minimum optical power level that must be launched into the fiber to maintain an optical power level of 2.0 μW at the receiving end? (ii) What is the required input power if the fiber has a loss of 0.6 dB/km?			

4	a	Compare the rms pulse broadening per kilometer due to intermodal dispersion for the multimode step index fiber of with a core refractive index of 1.5 and a relative refractive index difference of 1% with the corresponding rms pulse broadening for an optimum near-parabolic profile graded index fiber with the same core axis refractive index and relative refractive index difference.	10	2	3
	b	A glass fiber exhibits material dispersion given by $\lvert\lambda^2(d^2n_1/d\lambda^2)\rvert$ of 0.05. Determine the material dispersion parameter at a wavelength of 0.85 μm, numerical aperture of 0.3 and core refractive index of 1.45. Estimate the total rms pulse broadening per kilometer for a good LED source with an rms spectral width of 20 nm at this wavelength.			
5	a	Assume that 193.4 THz and 194 THz are the two frequencies launched at the input of the fiber. Find the number of new frequencies and their values at the output of the fiber due to wave mixing effect.	10	2	3
	b	Cross Phase Modulation is a nonlinear effect in Multi-wavelength transmission systems. Justify.			