VIT
Vellore Institute of Technology

SLOT: B1

Vellore – 632014, Tamil Nadu, India

SCHOOL OF ELECTRONICS ENGINEERING

FALL SEMESTER 2024-2025

CAT-1

Programme: B.Tech	**Branch: ECE, BML**	**Course code: BECE308 L**
Course Name: Optical Fiber Communications		**Date and Time: 26/08/2024, 9.30 to 11.00 AM**
Class Nbr: VL2024250102788 VL2024250102796 VL2024250102799 VL2024250102792 VL2024250102804 VL2024250102808 VL2024250102806	**Max Marks: 50**	**Duration: 90 mins**
Faculty name(s): ***Dr G Aarthi, Dr S Rajalakhsmi, Dr.N.Sangeetha, Dr.Subhra Sankha sarma, Dr.Paresh Sagar, Dr.Tangudu Ramji.Dr.Jagana Bihari Padhy.***		

General instruction(s): 1. Answer ALL

S.No	Question	Marks
1.	Using simple ray theory, describe the mechanism for the transmission of light within an optical fiber. Briefly discuss with the aid of a suitable diagram what is meant by the acceptance angle for an optical fiber. Show how this is related to the fiber numerical aperture and the refractive indices for the fiber core and cladding. An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.33. Comment on any assumptions made about the fiber. Determine: (a) The acceptance angle for the fiber in rock salt which has a refractive index of 1.59? (b) The critical angle at the core–cladding interface? (c) A step index fiber in air has a numerical aperture of 0.16, a core refractive index of 1.45 and a core diameter of 60 μm. Determine the normalized frequency for the fiber when light at a wavelength of 0.9 μm is transmitted. Further, estimate the number of guided modes propagating in the fiber?	10
2.	a. Explain the key elements of fiber optical communication system with a neat sketch.	5
	b. What is Large mode area fiber ? Write the advantage and application of the same.	5
3.	a. Discuss the absorption losses with respect to intrinsic absorption in optical fibers and how we can minimize it.	5

	b. A certain optical fiber has an attenuation of 0.6 dB /km at 1330 nm and 0.3 dB/km at 1550 nm. Suppose the following two optical signals are launched simultaneously into the fiber: an optical power of 150 μW at 1310 nm and an optical power of 100 μW at 1550 nm. What are the power levels of these two signals at (i) 8 km and (ii) 20 km?	5
4.	A multimode step index fiber has a relative refractive index difference of 1% and a core refractive index of 1.6. The optical link length is 8 km. Determine : (a) The delay difference between the slowest and fastest modes at the fiber output. (b) The rms pulse broadening per kilometre resulting from intermodal dispersion. (c)The maximum bit rate that may be obtained assuming only intermodal dispersion. (d) The bandwidth–length product corresponding to (c) assuming NRZ encoding.	10
5.	a. Find the attenuation coefficient of a 60 km long single mode fiber of core diameter 8μm which induces stimulated Raman scattering for a threshold optical power of 1.17 W when the wavelength of the light signal launched is 1.55 μm.	5
	b. What is four wave mixing? How it affects multichannel propagation?	5