Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Sixth Semester

Electronics and Communication Engineering

CEC345- Optical Communication & Networks

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	A silica optical fiber has a core refractive index of 1.5 and a cladding refractive index of 1.47. Determine the numerical aperture and acceptance angle in air of the fiber.	AP	1	2
2.	Define acceptance angle and critical angle of the fiber.	RE	1	2
3.	What is intermodal dispersion? What is it cause?	RE	2	2
4.	List out the advantages of graded Index fiber.	AN	2	2
5.	What are the drawbacks of avalanche photo diode?	RE	3	2
6.	Compare LED and LASER.	UN	3	2
7.	What are the methods employed for measuring attenuation in optical fiber?	RE	4	2
8.	How would you define receiver sensitivity.	RE	4	2
9.	Illustrate the key features of WDM.	UN	5	2
10.	What is a long haul network?	RE	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Draw the functional blocks of an optical communication link with a neat block diagram and explain.	AN	1	8
		ii	Consider a dielectric slab having a thickness d = 10mm and index of refraction n_1 = 1.50. Let the medium above and below the slab be air, in which n_2 = 1. Let the wavelength be λ = 10mm (equal to the thickness of the waveguide). What is the critical angle for the slab waveguide?	AP	1	5
			Or			
	b	i	Determine the normalized frequency at 820 nm for a step index fiber having a 25 µm core radius, a core index n_1 = 1.48 and n_2 = 1.46. a) How many modes propagate in this fiber at 820 nm? b) How many modes propagate in this fiber at 1320 nm? c) How many modes propagate in this fiber at 1550 nm?	AP	1	8
		ii	Examine the propagation modes of single-mode fiber and how they influence signal transmission.	AN	1	5

12.	a		Provide a detailed overview of the different types of attenuation in optical fibers, including relevant diagrams and examples to illustrate each type.	AN	2	13
			Or			
	b		What is waveguide dispersion? Derive an expression for time delay produced due to waveguide dispersion.	AN	2	13
13.	a		Derive the expression for the quantum efficiency and the resulting output power of a non-Coherent light source.	AN	3	13
			Or			
	b	i	Investigate the various Modes and the threshold condition for LASER oscillations and list the adverse effects of the temperature over the threshold current of the laser diodes.	AN	3	7
		ii	With a neat diagram explain the four basic methods for achieving current confinement in laser diodes.	AN	3	6
14.	a	i	With a typical experimental arrangement brief the fiber attenuation measurement process.	RE	4	7
		ii	Discuss the measurement of fiber dispersion in the frequency domain and its significance.	UN	4	6
			Or			
	b	i	Discuss in detail the measurement technique used for refractive index profile.	UN	4	7
		ii	Provide a summary on the measurement of cut-off wavelength in optical fibers.	UN	4	6
15.	a	i	What are the different types of wavelength division multiplexing? Discuss in detail.	UN	5	6
		ii	With example discuss optical network routing.	AP	5	7
			Or			
	b		What are the key advantages and challenges of implementing optical circuit switched networks compared to traditional electronic circuit-switched networks?	RE	5	13

*PART – C (Marks 1*15 = 15)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
16.	a	i	Describe the different types of optical fibers based on ray optics principles.	UN	1	5
		ii	What is meant by material dispersion? Derive the expression for material dispersion.	AN	2	10
			Or			
	b	i	Compare and contrast the two fundamental LED configurations and explain their operating principles.	AN	3	8
		ii	Analyze the characteristics of Metropolitan Area Networks (MANs), and how do they facilitate connectivity within urban environments?	AN	1	7