Total number of printed pages: 02

D/5th/DECE514B

2023

OPTICAL COMMUNICATION AND NETWORKING

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

Q1.	a)	What do you mean by Optical Fiber?	3
	b)	Explain the historical developments of the optical fiber communication.	7
	c)	Explain the fiber optic communication system in details by using its block diagram.	10
Q2.	a)	Explain the main advantages and disadvantages of the optical fiber communication.	3
	b)	Explain the following terms: Transverse waves, phase wave front, Polarization, snell's law, Refractive Index.	3x5=15
	c)	Figure out the values of refractive index of the following substances: Glass and Air	2
Q3.	a)	Explain the condition of Snell's Law by considering the refraction and reflection of a light ray at a material boundary.	7
	b)	At a glass-air interface explain when totally internally reflection occurs by considering the condition of critical angle, refracted ray and non-refracted ray.	7
	c)	A light ray travelling in air is incident on a smooth, flat slab of crown glass, which has a refractive index $n_2 = 1.52$. If the incoming ray makes an angle of $\varphi_1 = 30.0^o$ with respect to the normal, what is the angle of refraction φ_2 in the glass?	6
Q4.	a)	By considering Ray optics representation explain the skew ray and meriodinal ray optics propagation mechanism in an ideal step index optical waveguide.	10
	b)	Define Numerical aperture. Consider a multimode fiber that has a core refractive index of 1.480 and a core-cladding index difference 2.0 %. Find the (a) numerical aperture, (b) the acceptance angle and (c) the critical angle.	1+5=6

	c)	What do you mean by Single mode step index fiber and Multimode graded index fiber.	4
Q5.	a)	What are the basic requirements that must be satisfied in selecting fiber material?	3
	b)	Explain the main two different types of fiber materials that are needed to manufacture the optical fiber cables by considering its various fiber compositions.	7
	c)	Define signal attenuation of an optical fiber. Also find its attenuation coefficient by mentioning the optical power in the fiber.	1+4=5
	d)	What are the three different mechanisms of absorption in an optical fiber?	5
Q6.	a)	Explain the process of broadening and attenuation of two adjacent pulses when they travel along an optical fiber during signal dispersions.	6
	b)	Differentiate between intermodal dispersion and intramodal dispersion. Also explain two different types of intramodal dispersion.	2+4=6
	c)	Explain the two different LED structures by using proper schematic diagrams.	8
Q7.	a)	Explain the three different key transition processes involved in laser action in details.	10
	b)	Define population inversion and pumping techniques in the Laser diodes.	4
	c)	Explain the reach through process of Avalanche photodiode by using its proper diagram.	6

*****