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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M. Sc. (Third Semester) Regular Examinations, December – 2024

22PHCBOE306 – Optical Fiber and Optoelectronics

(Physics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Write Maxwell's equations of electromagnetism in a medium.	CO1	K1
b.	Find the cladding index and acceptance angle of an optical fibre cable having Numerical Aperture 0.4 and core index of 1.52.	CO1	K2
c.	Graphically show the variation of refractive index of silica glass (fiber materials) as a function of concentration of various dopants.	CO1	K1
d.	The input power to an optical fiber is 4 mW while the power measured at the output end is 2 μW. If the fiber attenuation is 0.2 dB/km, calculate the length of the fiber.	CO2	K2
e.	Mention extrinsic losses in optical fiber with diagrams	CO2	K1
f.	State the lensing scheme for coupling improvement.	CO3	K1
g.	Write a note on optical fiber coupler.	CO3	K1
h.	Find the external Quantum efficiency values for Si and Ga As.	CO4	K2
i.	Describe the light source materials.	CO4	K1
j.	Draw the structure of LASER diode.	CO4	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ANY FIVE*** questions		Marks	CO #	Blooms Level
2. a.	Write short notes on Fiber Bragg Grating with diagram.	5	CO1	K1
b.	Write short notes on Fiber optic cable with diagram.	5	CO1	K1
3.a.	Mention the fabrication of optical fiber materials by double crucible method.	5	CO2	K1
b.	Describe in detail scattering losses in optical fibers	5	CO2	K2
4. a.	Explain material and wave guide dispersions with graph.	6	CO2	K2
b.	Two compatible multimode SI fibers are jointed with a small air gap. The fiber axes and end faces are perfectly aligned. Determine the refractive index of the fiber core if the joint is showing a loss of 0.47 dB.	4	CO3	K2
5.a.	Define a Connector. Explain the different types of connectors.	5	CO3	K1
b.	Define splicing. Discuss about fusion splices with a neat diagram.	5	CO3	K1
6. a.	What is a p-n photodiode? Discuss its function with diagram.	6	CO4	K1

	Photons of wavelength 0.90 μm are incident on a p-n photodiode at a rate of 5 x 10^{10} s^{-1} and, on an average, the electrons are collected at the terminals of the diode at the rate of 2 x 10^{10} s^{-1}. Calculate (a) the quantum efficiency and (b) the responsivity of the diode at this wavelength			
b.	Discuss structure and working of a p-i-n photodiode (PIN).	4	CO4	K1
7.a.	Define LED.	2	CO4	K1
b.	Discuss briefly about ELED AND SLED with diagrams.	8	CO4	K2
8. a.	Explain optical amplifier.	2	CO4	K1
b.	Discuss the structure and working of semiconductor optical amplifier (SOA).	8	CO4	K2

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