Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)

M.Sc. (Third Semester – Regular) Examinations, December – 2025

24MPHPC23004– Optical Fibres & Optoelectronics

(Physics)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Write Maxwell's equations of electromagnetism in a medium.	CO1	K1
b.	What do you mean by Repeater?	CO2	K1
c.	Mention extrinsic losses in optical fibre with diagrams.	CO3	K1
d.	Find the cladding index and acceptance angle of an optical fibre cable having Numerical Aperture 0.5 and core index of 1.42.	CO4	K2
e.	Draw the structure of LASER diode.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Distinguish between step index and graded index fibres. A step index optical fiber has a core refractive index of 1.48, a cladding refractive index of 1.46 and a core radius of 100 μm. Calculate NA, acceptance angle and Critical angle.	10	CO1	K1
	(OR)			
b.	Analyze the transmission of light through a cylindrical waveguide focusing on derivation of wave equation from Maxwell equation, mode field distribution and propagation characteristics.	10	CO1	K2
3.a.	Discuss dispersion shifted fiber.	5	CO2	K1
b.	Explain waveguide dispersion and material dispersion. How can be these two dispersions be minimized?	5	CO2	K1
	(OR)			
c.	Illustrate the phenomenon of signal distortion in a single mode fiber due to group velocity dispersion. How does this affect the system bandwidth.	5	CO2	K1
d.	Discuss dispersion flattened fiber.	5	CO2	K1
4.a.	Discuss in detail about the block diagram of fibre optic communication link.	4	CO3	K2
b.	With neat diagram explain lensing schemes use to enhance optical coupling efficiency.	6	CO3	K2
	(OR)			
c.	Compare between mechanical splice to Fusion splice.	10	CO3	K2
d.	Discuss joint losses and methods to minimize in a optical fiber.			
5.a.	Briefly explain the threshold condition in LASER diode.	4	CO4	K2

b.	Discuss the choice of source materials for LEDs and LASER diodes. Compare between direct and indirect bandgap semiconductor.	6	CO4	K1
	(OR)			
c.	Explain the operating principle of LED. Discuss the process of radiative recombination, internal and external quantum efficiency and factors affecting emission output.	10	CO4	K1
6.a.	Compare the various optical amplifiers such as EDFA, SOA based on gain mechanism, wavelength range, Noise performance and application**.**	8	CO5	K1
b.	Photons of wavelength 0.90 μm are incident on a p-n photodiode at a rate of 5×10^{10} s^{-1} and on an average, the electrons are collected at the terminals of the diode at a rate of 2×10^{10} s^{-1}. Calculate the quantum efficiency and the responsivity of the diode at this wavelength.	2	CO5	K1
	(OR)			
c.	Explain the principle and operation of rare earth doped fiber amplifier in details including pumping scheme, energy level, application along with disadvantages of this amplifier.	10	CO5	K2

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