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

B. Tech (Fifth Semester - Regular) Examinations, November – 2024
22BECPE35011 – Fiber Optics Communication
(ECE)

Time: 3 hrs   Maximum: 70 Marks

(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.	A step index fiber has the normalized frequency of 26.6 at 1300 nm. If the core radius is 25 µm, find the numerical aperture.	CO1	K3
b.	Define Zero dispersion wavelength. What is its value for a SMF?	CO1	K1
c.	List out the difference between direct and indirect bandgap material.	CO2	K1
d.	An APD has a quantum efficiency of 50% at a wavelength of 500 nm in the absence of multiplication. If the device is operated with a reverse bias to give a multiplication factor of 8, calculate the responsivity.	CO3	K3
e.	Differentiate between an optical regenerator and optical amplifier.	CO4	K1

PART – B   **(15 x 4 = 60 Marks)**

Answer *ALL* questions

		Marks	CO #	Blooms Level
2. a.	A light pulse consisting of rays spread over an angle will be broadened as it propagates though the fiber. Derive an expression of pulse broadening per unit length of traversal.	7	CO1	K3
b.	A SI fiber has an NA of 0.17 and cladding refractive index of 1.46. Determine (a) The acceptance angle of the fiber when placed in water and (b) the critical angle at the core cladding interface.	8	CO1	K2

(OR)

		Marks	CO #	Blooms Level
c.	A step index fiber has an acceptance angle of 20^0 in air and a relative refractive index difference of 3% Estimate the NA and the Critical angle at the core-cladding interface.	7	CO1	K3
d.	Illustrate scattering loss & explain about its types.	8	CO1	K2
3. a.	Explain various types of mechanical splicing techniques with the help of suitable diagram.	7	CO2	K2
b.	With the help of a neat diagram explain the construction and working of an edge emitting LED.	8	CO2	K2

(OR)

		Marks	CO #	Blooms Level
c.	With the help of a neat diagram explain the construction and working of a surface emitting LED.	7	CO2	K2

d.	Write a brief note on fiber alignment and joint loss.	8	CO2	K2
4.a.	What is Noise? List and explain various types of noises encountered in the detector of an optical communication link? Establish S/N.	10	CO3	K2
b.	Write the basic principle of wavelength division multiplexing in optical communication.	5	CO3	K2

<div align="center">(OR)</div>

c.	Explain the principle, construction and working of APD	7	CO3	K2
d.	Explain the function of optical isolator and optical circulator in fiber optic communication system.	8	CO3	K2
5.a.	A step index signal-mode fiber has a core index of 1.54, relative refractive index difference of 0.31% and a core radius of 4.4 μm. Design the wave guide dispersion parameter for this fiber at $\lambda = 1.32\ \mu m$.	7	CO3	K3
b.	Describe salient features of semiconductor optical amplifiers.	8	CO4	K2

<div align="center">(OR)</div>

c.	A 60/120 μm GI fiber with a NA of 0.25 and a profile parameter of 1.9 is jointed with a 50/120 μm GI fiber with a NA of 0.20 and a profile parameter of 2.1. Considering that there is no air gap calculate the insertion loss in forward and backward direction.	7	CO4	K3
d.	Explain working of an SOA with the help of suitable diagram.	8	CO4	K2

<div align="center">--- End of Paper ---</div>