PAPER ID-310336

Roll No:

BTECH
(SEM V) THEORY EXAMINATION 2024-25
OPTICAL COMMUNICATION

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 07 = 14**

Q no.	Question	CO	Level
a.	Why does fiber optics promise to be the technology of choice for local area network?	1	2
b.	Calculate the velocity of light within glass having refractive index (n) equal to 1.5?	1	3
c.	Specify three peak wavelengths for the transparent windows in modern optical fibers.	2	1
d.	Define the term Photoluminescence.	4	1
e.	Suppose a laser diode radiates red light with wavelength of 650 nm. Calculate the energy of a single photon?	3	3
f.	How does photo diode converts light into electrical signal?	5	2
g.	Differentiate between coherent and non-coherent detection technique.	5	2

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	Draw a block diagram of fiber optic communications system and describe the function of each component.	1	2
b.	Define the term dispersion in optical fiber. How much will a light pulse spread after travelling along 5 km of a step index fiber whose numerical aperture is 0.275 and refractive index of the core is 1.487?	2	3
c.	With suitable energy band diagram explain the mechanisms of absorption, spontaneous, and stimulated emission in a compound semiconductor?	3	3
d.	Explain the principle of operation of a quantum well laser diode?	4	2
e.	With suitable block diagram explain Wavelength Division Multiplexing technique in optical fiber communication?	5	2

SECTION C

3. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Write the significance of total internal reflection in an optical fiber. The refractive index of core and cladding of a silica fiber are 1.48 and 1.46 respectively. Calculate the critical propagation angle? Find the total acceptance angle of the fiber?	1	3
b.	Write short notes on: i. Dispersion shifted and dispersion flattened fiber ii. Polarization mode dispersion	2	2

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4. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Explain basic techniques used to couple light from an LED into an optical fiber? Calculate the power coupled into a step index multimode fiber whose $n_1 = 1.48$ and whose $n_2 = 1.46$ if the surface light emitting diode (SLED) radiates 100 μW?	4	3
b.	Draw a graph depicting the typical input-output relationship in a laser diode and explain what mechanisms determine the course of the graph?	4	3

5. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	With suitable diagram explain the working of edge light emitting diode (ELED) and surface light emitting diode (SLED)?	3	2
b.	Write short note on: i. Dark Current ii. Bit Error Rate	5	2

6. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	How does responsivity depend on the wavelength of an optical signal? The responsivity of a photodiode is 0.85 A/W and the input power saturation is 1.5 mW. Calculate the photocurrent if the incident power is 1 mW?	4	3
b.	Write the major advantages of Avalanche Photo Diode over p-i-n photodiode.	4	2

7. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	What do you mean by mode coupling? Explain the various irregularities in the fiber of its causes.	2	2
b.	Draw a functional block diagram of a receiver and briefly explain the function of each component?	5	2