P235

SE	АТ	No.
		110.

[Total No. of Pages : 2

[Max. Marks : 30

BE/INSEM/APR-565 B.E. (E & TC)

404190: BROADBAND COMMUNICATION SYSTEMS (2015 Pattern) (Semester - II)

Time : 1 Hour]

Instructions to the condidates:

- 1) Answer Q1. or Q2. Q3. or Q4, Q5 or Q6.
- 2) Near diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Define and explain the following terms in context of an optical fiber: [6]

- i) Numerical aperture
- ii) Critical angle
- (iii) Total internal reflection

b) A step index multimode fiber with numerical aperture of 0.2 supports approximately 100 modes at 850nm wavelength. [4]

- i) Calculate the diameter of the core.
- ii) How many modes does the fiber support at 1310nm?

OR

- Q2) a) With neat sketches explain the microbending and macrobending effects in optical fiber. How to minimize bending losses? [6]
 - b) Explain detection process in PIN photodiode. Compare this device with APD photodiode. [4]
- **Q3)** a) Make a power budget and check the system feasibility for a short-haul system of 5 Km with required data rate of 20 Mbps. BER of 1×10^{-9} errors/ bit and it is operating at $\lambda = 850$ nm. The Si PIN photodiode has a receiver sensitivity of about -42 dBm. GaA1As LED can couple 50 μ W into multimode fiber with a core diameter of 50 μ m. The connector loss is 1 dB per connector. Splices will be required at each kilometer with 0.5 dB per splicing loss, and fiber attenuation loss for the fiber is 3.5dB/km. [6]
 - b) Enlist the system design considerations for an optical communication network. [4]

P.T.O.

- Q4) a) Make a rise time budget for a 0.85µm, 150km fiber link designed to operate at 622Mbps. The LED transmitter and the Si PIN receiver have rise times of 0.1ns and 0.5 ns, respectively. The graded index fiber has D = 10ps/km-nm. LED spectral width is 0.15 nm. Can the system be designed to operate with NRZ format? [5]
 - b) Find the maximum permissible link length for a lightwave system with data rate = 20 Mbps, bit error rate of 10^{-9} . [5]

Transmitter: GaAlAs LED can couple 60µW average optical power into the fiber.

Receiver; Silicon PIN photodiode operating at 850nm, require receiver input signal of -40dBm.

Fiber: $\alpha = 3.2 \text{ dB/km}$

Connector loss: 1dB.

Q5) a) $A 2 \times 2$ fiber coupler has an input optical power level of $P_0=135\mu$ W. The coupler output powers are $P_1=60\mu$ W, $P_2=55\mu$ W, $P_3=4.3n$ W. Find the following coupling parameters. [6]

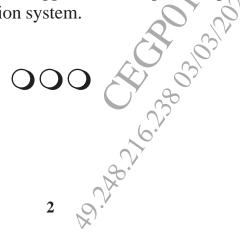
i) Splitting ratio.

- ii) Crosstalk.
- iii) Insertion loss.
- iv) Excess loss.
- b) With neat sketches explain the operation of FBG based optical add/drop multiplexer. [4]

OR

Q6) a) With the help of neat sketch describe WDM architectures. [6]

b) Explain the different possible applications of optical amplifier in a practical fiber optic communication system. [4]



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