

Total No. of Questions : 8]

SEAT No. :

PE-2223

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[6584]-124

**B.E. (Electronics & Telecommunication Engineering)**

**FIBER OPTIC COMMUNICATION**

**(2019 Pattern) (Semester - VIII) (404190)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates :*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8 from the following questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a)** Explain the working of A valanche photodetector with a neat diagram. [6]
- b) Define the term quantum efficiency and the responsivity of a photodetector. How the quantum efficiency and the responsivity of a photodetector are related to each other. [6]
- c) When  $3 \times 10^{11}$  photons each with a wavelength of  $0.85 \times 10^{-6}$  m are incident on a photodiode on average  $1.2 \times 10^{11}$  electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at  $0.85 \mu\text{m}$ . [6]

OR

- Q2) a)** Explain the following terms in terms of an optical detector. [6]
- i) Dark Current Noise
  - ii) Quantum Noise
  - iii) Thermal Noise
- b) Describe the basic detection process in a photoconductive detector. Also, state any two advantages and disadvantages of a photodiode. [6]
- c) An avalanche photodiode has a quantum efficiency of 45% at  $0.85 \mu\text{m}$ . When illuminated with radiation of this wavelength it produces an output photocurrent of  $10 \mu\text{A}$  after avalanche gain with a multiplication factor of 250. Calculate the received optical power to the device. [6]

P.T.O.

- Q3)** a) Explain in detail the importance of budgets. What are the different system considerations for the rise time budget? Explain with equations. [6]
- b) Enlist the system design considerations for an optical communication network. [6]
- c) An engineer has the following components available [6]
- GaAlAs laser diode operating at 850 nm and capable of coupling 1 mW (0 dbm) into a fiber
  - 10 sections of cable each of which is 500m long has a 4 db/km attenuation and has connectors on both ends.
  - Connector loss of 2 db/connector
  - A pin Photodiode receiver
  - An avalanche photodiode receiver
- Using these components, the engineer, wishes to construct a 5 km link operating at 20 Mb/s. If the sensitivities of the PIN and APD receivers are  $-45$  dbm and  $-56$  dbm respectively, which receiver should be used if a 6 dB system operating margin is required?

OR

- Q4)** a) Write a short note on : [6]
- Optical Isolators
  - Optical circulators
- b) With the help of neat sketch describe WDM architectures. [6]
- c) A  $2 \times 2$  fiber coupler has an input optical power level of  $P_0 = 135 \mu\text{W}$ . The coupler output powers are  $P_1 = 60 \mu\text{W}$ ,  $P_2 = 55 \mu\text{W}$ ,  $P_3 = 4.3 \mu\text{W}$ . Find the following coupling parameters [6]
- Splitting Ratio
  - Cross Talk
  - Insertion Loss
  - Excess Loss

- Q5)** a) Explain the desirable properties of optical network with advantages. [6]
- b) Describe the Gigabit Passive Optical Network (GPON) using an appropriate diagram. [6]
- c) Compare Asynchronous and Synchronous Optical Network. [5]

OR

- Q6)** a) What is FTTX? Draw and Explain the architecture of FTTX. [6]  
b) Explain the concept of FDDI with an appropriate diagram. [6]  
c) Compare Active Optical Network (AON) and Passive Optical Network (PON). [5]

- Q7)** a) Using an appropriate diagram, describe and explain the experimental setup used in the OTDR technique. [6]  
b) Describe the Eye Diagram Test. Give an explanation of the basic measuring parameter. [6]  
c) Explain the experimental setup for the time-domain fiber dispersion measurement with suitable diagram. [5]

OR

- Q8)** a) Draw and explain the schematic of the experimental setup used to calculate fiber attenuation using the cutback method. [6]  
b) Explain optical spectrum analyzer in detail. [6]  
c) Explain the NA measuring technique with the help of diagram. [5]

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