Total No. of Questions : 8]

SEAT No. : ____

PD4631

[Total No. of Pages : 3

[6404]-137
B.E. (E&TC)
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, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) A given silicon APD has a quantum efficiency of 65% at a wavelength of 900 nm. Suppose 0.5 μw of optical power produces a multiplied photocurrent of 10 μA. Find multiplication factor. **[5]**

b) Compare pin diode and APD w.r.t. following. **[6]**

i) Response time
ii) Bias
iii) Output current
iv) Internal gain
v) Cost
vi) Complexity

c) What are the different noise sources in photo detectors? Explain the following. **[7]**

i) Quantum noise
ii) Dark noise
iii) Thermal noise

OR

Q2) a) Define & explain the following terms w.r.t. optical detector. **[6]**

i) Quantum Efficiency
ii) Responsivity
iii) Long cut off wavelength

b) When 3×10^{11} photons each with a wavelength of 0.85 μm are incident on a photodiode, on average 1.2×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at 0.85 μm. **[6]**

c) Explain performance and compatibility requirements for photodectors. **[6]**

P.T.O.

Q3) a) Enlist various types of optical amplifiers and explain SOA in detail. **[6]**

b) Draw the block diagram of a point to point optical fiber link and explain the function of blocks needed in it. **[6]**

c) An optical fiber transmission system is to be designed to operate on 8km length without repeaters. The rise time of the chosen components are source LED : 8ns, Fiber cable: intermodal :5ns/km, Intramodal: 1ns/km, Detector PIN :6ns Estimate maximum bit rate that may be achieved on the link when using NRZ and RZ formats. **[6]**

OR

Q4) a) Explain the working principle of Fiber Bragg Grating. Enlist applications of FBG. **[6]**

b) Write short notes on. **[6]**

i) Optical Isolator

ii) Optical Circulator

iii) Optical Add/Drop Multiplexers:

c) A 2 X 2 biconical tapered fiber coupler has an input optical power level of P0= 200 mW. The output powers at the other three ports are P1=90 mW, P2= 85 mW, and P3= 6.3 nW. What are the coupling ratio, excess loss, insertion losses, and return loss for this coupler? **[6]**

Q5) a) Compare synchronous and asynchronous optical network. Explain SONET with respect to structure and elements. **[6]**

b) With suitable diagram explain Gigabit Passive Optical Network (GPON). **[6]**

c) Define Optical Network .Explain the term optical node and light path with suitable diagram. **[5]**

OR

Q6) a) Define network topology. State and explain types of network topologies with suitable diagram. **[6]**

b) What is FTTX what are the different categories of FTTX Explain FTTX with respect to architecture, advantages. **[6]**

c) Compare active optical network (AON) and passive optical network (PON).Explain concept of PON with the help of diagram. **[5]**

Q7) a) With suitable diagram explain signal attenuation in an optical fiber by cutback technique. **[6]**

b) An engineer wants to find the attenuation at 1310 nm of a 4.95-km long fiber. The only available instrument is a photo detector, which gives an output reading in volts. Using this device in a cutback attenuation setup, the engineer measures an output of 6.58 V from the photodiode at the far end of the fiber. After cutting the fiber 2 m from the source, the output voltage from the photo detector now reads 2.21V. What is the attenuation of the fiber in dB/km? **[5]**

c) What are the different methods for measurement of Numerical Aperture of a fiber? Explain trigonometric method with suitable diagram. **[6]**

OR

Q8) a) What are the different methods for measurement of fiber attenuation? With the help of neat diagram explain insertion loss technique. **[6]**

b) The insertion-loss technique also can be used for measuring the loss through an optical device that has fiber fly leads attached. Consider the case when the power at the photo detector prior to inserting the filter is P1 = 0.51 mW and the power level with the optical filter in the link is P2 = 0.43 mW. What is the insertion loss of the device? **[5]**

c) Enlist different measurement techniques for fiber dispersion Describe frequency domain dispersion measurement with the suitable diagram.**[6]**

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