Roll No. : 15EEBEC026

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B.Tech. VI-Sem (Main & Back) Examination, April-May. 2018
Electronics & Communication Engg.
6EC6.3A Optical Fiber Communication

Time : 3 Hours]

[Maximum Marks : 80
[Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____Nil_____   2. _____Nil_____

UNIT - I

1 (a) Explain what you mean by a step index and graded index optical fiber ? Giving an expression for the possible refractive index profile. Why a graded index fiber with a parabolic index profile is preferred ?

2+2+4

   (b) What are the materials require for manufacturing the optical fiber ? Describe the modified chemical vapor phase deposition (MCVD) method for preparation of optical fiber.

3+5

OR

1 (a) Compare the single mode and multimode optical fiber. An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Determine :

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(i) The acceptance angle for the fiber in water which has a refractive index of 1.33;

(ii) The critical angle at the core-cladding interface.

4+2+2

(b) What is Dispersion ? Explain different types of dispersion. Why single mode fibers use in the commercial communication systems ?

2+4+2

UNIT - II

2 (a) Calculate the internal quantum efficiency for LED whose radiative and non-radiative life time are 2.5 ms and 60 ms respectively.

8

(b) Explain direct bandgap and indirect bandgap semiconductor materials. Which type of material is use for optical fiber ? Also explain their applications in optoelectronics.

4+2+2

OR

2 (a) Describe the following characteristics of injection LASER;
   (i) Frequency chirp
   (ii) Noise
   (ii) Reliability
   (iv) Threshold current temperature dependence

2×4=8

(b) Describe the optical characteristics of LED with neat sketch.

8

UNIT - III

3 (a) A photodiode has a quantum efficiency of 65% when photons of energy 1.5×10^{-19} J are incident upon it.
   (i) At what wavelength is the photodiode operating ?
   (ii) Calculate the incident optical power required to obtain a photocurrent of 2.5 μA when the photodiode is operating as described above.

4+4

(b) What is the difference between splices and connector ? Explain different types of splices with neat diagram.

2+6

OR

3 (a) A four port multimode fiber FBT coupler has 60 μW optical power launched into port 1. The measured output power at port 2, 3 and 4 are 0.004, 26.0 and 27.5 μW respectively. Determine the excess loss, the insertion losses between the input and the output ports, the crosstalk and the split ratio for the device.

2+2+2+2

(b) Explain the following terms of photo diode.
   (i)   Quantum efficiency
   (ii) Responsivity

4+4

UNIT - IV

4 (a) A trigonometric measurement is performed in order to determine the numerical aperture of a step index fiber. The screen is positioned 10 cm from the fiber end face. When illuminated from a wide angled visible source the measured output pattern size is 6.2 cm. Calculate numerical aperture of fiber.

8

(b) What is the working principle of Optical time domain reflectometry (OTDR) ? Explain the process of fault location identification through OTDR in field.

4+4

OR

4 (a) Explain the frequency domain technique for measurement of dispersion with neat diagram.

8

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(b) Explain the Laser based system for measurement of distance with neat diagram.

8

UNIT - V

5 (a) Describe the Wavelength division multiplexing (WDM) and compare with dense wavelength division multiplexing (DWDM).

4+4

(b) Write down the applications of optical communication in daily life. Also gives its advantages and drawbacks with classifications.

4+4

OR

5 (a) What is the need of optical amplifiers ? Explain Erbium dopted fiberamplifier (EDFA) with neat diagram.

2+6

(b) Write short note on optical sensors.

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