Exam.Code:0930
Sub. Code: 6918

2061

B.E. (Electronics and Communication Engineering)

Sixth Semester

EC-602: Fiber Optic Communication System

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) Define numerical aperture (NA) of an optical fiber. Give the relation between numerical aperture and acceptance angle for a step index optical fiber.

b) An LED delivers -40 dBm of optical output power. Convert this power to mW.

c) Why bending loss occurs in optical fiber? Define bend radius of curvature for an optical fiber.

d) Draw P-I characteristics for a laser diode and label the regions below and above the threshold current.

e) What is Free Space Optics (FSO)? Compare FSO with wireless microwave link.

(5x2)

UNIT - I

II. a) Draw block diagram of fiber optics communication system comprising a laser diode and p-i-n photodetector. Give three advantages and three disadvantages of optical fiber as transmission media over conventional metallic conductors.

b) Draw refractive index profile and ray propagation for step index and graded index fibers. (6,4)

III. a) Describe various intrinsic and extrinsic loss mechanisms possible at a fiber-to-fiber joint.

b) Explain the Rayleigh scattering loss in optical fibers. How this loss can be minimized in communication grade optical fibers? (6,4)

P.T.O.

IV. a) Describe various dispersion mechanisms contributing to overall fiber dispersion. How dispersion affects are minimized in high speed OFC links.

b) Differentiate between Self phase modulation and Cross phase modulation in optical fibers. How these effects can be avoided in multichannel OFC systems. (6,4)

UNIT - II

V. a) Sketch energy level diagrams for direct and indirect semiconductor materials. List the consideration for an efficient optical source used in OFC applications.

b) Plot the light output against current characteristics of a LED. Explain the variation of light output with temperature. (2x5)

VI. a) Explain the need for optical feedback in lasers. Give the relation between total quantum efficiency and the threshold current for the laser device.

b) A photodiode has a quantum efficiency of 62% when photons of energy $1.5x10^{-19}$ J are incident upon it. Determine i) At what wavelength the photodiode is operating? ii) The incident optical power required to obtain a photocurrent of 2.4 microampere when the photodiode is operating. (2x5)

VII. a) Describe the design considerations for power budget and rise time budget in an OFC link. How these budgets affect the bit error rate of the system.

b) Explain working principle of a fiber optic sensor (FOS). Give benefits of FOSs over conventional optical sensors. (6,4)

x-x-x