Exam.Code:0930
Sub. Code: 6918

2072

B.E. (Electronics and Communication Engineering)

Sixth Semester

EC-602: Fiber Optic Communication System

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

1. a) Define the units of dB and dBm. Explain why dBm is more preferred compared to mW as a unit of optical power.
   b) Define numerical aperture and what are the values of core diameters for SMF and MMF.
   c) List at least five features of LED and laser on which you can make a comparison of two devices.
   d)Write down the advantages and applications of FSO system in comparison to fiber-optic communication systems.
   e) Define optical signal to noise ratio.

   5 x 2 = 10

PART-A

2. a) Explain & sketch the attenuation characteristics of a single mode fiber and also explain in brief the various factors which are responsible for fiber attenuation. 6
   b) Determine the normalized frequency at 820nm for a step index fiber having a 25 μm core radius, $n_1 = 1.48$ & $n_2 = 1.46$. How many modes will propagate in this fiber at 820 nm. What percent of the optical power flows in the cladding. 4

3. a) A continuous 20 Km long optical fiber link has a loss of 1.0 dB/Km. what is the minimum optical power level that be launched in to the fiber to maintain an optical power level of 0.3 μW at the receiving end. 3
   b) Explain what are the suitable materials for the manufacturing of optical fiber. Discuss with the aid of a suitable diagram any one fiber fabrication method. 7

4. a) Write a short note on Self Phase Modulation and Stimulated Raman Scattering. 5
   b) Explain the need for optical communication. Also sketch the block diagram of an optical fiber system and explain the function of each of its element. 5

PART-B

5. a) Write short note on Free Space Optic Communication and explain how the weather conditions effects the propagation of optical signal through free space. 6
   b) Calculate the responsivity of a p-i-n photodiode at 1.3 um and 1.55 um if quantum efficiency is 80 %. Why is the photodiode more responsive at 1.55 um? 4

6. a) A double-heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and nonradiative recombination times 25 ns and 90 ns, respectively. The drive current is 35 mA. Find *the internal quantum efficiency and the internal power level*. If the refractive index of the light source material is n = 3.5, find the *emitted power* from the device. (3 + 2 = 5)

P.T.O.

b) Make the power budget and calculate the maximum transmission distance for a 1.3 μm lightwave systems operating at 100 Mb/s and using an LED for launching 0.1 mW of average power in to the fiber. Assume 1 dB/Km fiber loss, 0.2 dB splice loss every 2 KM, 1 dB connector loss at each end of fiber link and 100 nW receiver sensitivity. Allow 6-dB system margin. 5

7. a) Sketch a well labeled Eye diagram and explain all the parameters that can be measured from an eye pattern. 6

b) Discuss the working principle of a suitable intensity modulated fiber-optic sensor with the help of a diagram. 4

x-x-x