Exam.Code:0930
Sub. Code: 6605

2053

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 Part. Use of scientific calculator is allowed.

x-x-x

I. **(a)** Differentiate between repeater and optical amplifier. **(1)**
(b) What is WDM? **(1)**
(c) What is difference between splices and connectors? **(1)**
(d) What are loss-limited light wave systems? **(1)**
(e) What is fiber grating? **(1)**
(f) Define internal quantum efficiency of LED. **(1)**
(g) Differentiate between step index and graded index fiber. **(1)**
(h) What is Four Wave mixing? **(1)**
(i) Define dB and dBm. Which is preferred compared to mW as a unit of optical power and why? **(2)**

Part- A

II. **(a)** Explain advantages and disadvantages of optical fiber systems over copper cable-based communication system. **(4)**
(b) Using ray theory, describe the mechanism of propagation of light in an optical fiber. What is acceptance angle? How it is related to numerical aperture and refractive indices of the core and cladding of fiber cable? **(6)**

III. **(a)** Explain with the help of ray diagram
(1) single mode step index fiber
(2) multimode step index fiber
Compare the advantages and disadvantages of the two types for use as optical channel. **(5)**
(b) Discuss absorption loss in optical fibers, comparing and contrasting the intrinsic and extrinsic absorption mechanisms. **(5)**

IV. **(a)** Explain the various dispersion mechanisms that affect data rate carrying capability of optical fibers. How this effect is tackled in practical high speed optical fiber systems? **(7)**
(b) Briefly list the requirements that must be satisfied by the materials to be selected for fabrication of optical fibers. **(3)**

Part-B

V. **(a)** Explain advantages and disadvantages of LED compared with injection Laser for use as light source in optical fiber communication systems. **(5)**

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(b) Explain the principle of working of Laser. Explain with the help of energy level diagram, the requirements of population inversion so that stimulated emission may dominate over spontaneous emission. **(5)**

VI. (a) Explain briefly free space optic communication. Explain the effect of weather on the optical signal propagation through free space. **(4)**

(b) Briefly describe the basic applications & types of optical amplifiers. **(6)**

VII. (a) Briefly describe the principle of optical detection. A p-i-n photo diode gives one electron-hole pair for three incident photons at a wavelength of 0.8 μm. If all the electrons are collected, calculate:

(1) Quantum efficiency of the device

(2) Maximum possible bandgap energy

(3) Mean output photocurrent when the received optical power is 10^{-7} W.

(Plank's constant $h = 6.625 \times 10^{-34}$ J.s) **(5)**

(b) Sketch a well-labelled Eye diagram and explain all the parameters that can be measured from an eye diagram. **(5)**

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