E | VIII | Rev. | Optical Fiber Communication | 26/5/07
Extc

RT-Ex-07-384

Con. 2429–07. [REVISED COURSE] ND–9642

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assumption made should be **clearly** stated.
(4) **Figure** to **right** hand side indicate **full** marks.
(5) Answer **continuity** should be maintained.
Important Data : $K = 1.381 \times 10^{-23}$ J/K, $q = 1.6 \times 10^{-19}$c, $h = 6.6256 \times 10^{-39}$J–s, $C = 3 \times 10^{8}$ m/s

1. Answer the following questions in brief :– 20
   (a) What do you mean by optical communication ? Draw its basic block diagram.
   (b) Coherent optical communication is preferred over non-coherent optical communication. Why ?
   (c) Draw the structure for PIN diode and state the importance of I–layer in context with its application as photodetector.
   (d) With the help of LED structure explain its working.
   (e) What do you mean by dark current ? Which optical device carry dark dark ? What is the order of this current ? What are the causes ?

2. Derive the following relationship :– 20
   (a) Number of bound mode M in GIF.
   (b) Numerical aperature of GIF.
   (c) Permissible range for β in case of SIF.
   (d) Relationship between LED current and optical output power.

3. Compare the following :– 20
   (a) GIF and SIF.
   (b) Photovoltaic and Photoconductive mode of operation of Photodetector.
   (c) Direct and indirect semiconductor.
   (d) Spontaneous emission and stimulated emission.

4. Explain the following :– 20
   (a) Optical receiver noise.
   (b) Optical power launching and coupling into optical fiber.
   (c) Modulation capability of LED and LD.
   (d) Temperature effect on avalanche gain.

5. (a) With the help of receiver configuration circuit diagram explain the working of optical receiver. Also derive the expression for output pulse. 10
   (b) Explain the various analysis used for transmission link analysis in optical communication. 10

6. Solve the following numericals :– 20
   (a) Compute the material dispersion at 1.55 μm, if the zero-dispersion wavelength is 1.3 μm. Assume $\mu_0 = -0.095$ ps/(nm^2 x km).
   (b) A receiver has a 10 cm focal length, a 1 cm photodetector diameter and air between the lens and detector. Compute the receiver NA and the full-cone angle.
   (c) The refractive index of InGaP is 3.41 at operating wavelength of 1.3 μm. Calculate the velocity of light in the optically active region of the material. Also compute the wavelength in the material.
   (d) Compute the cut-off parameter and the number of modes supported by a fiber $n_1 = 1.54$ and $n_2 = 1.5$. Core radius is 25 μm and operating wavelength is 1300 nm.

7. Write short notes on (any **four**) :– 20
   (a) Attenuation measurement
   (b) Propagation of optical signal through GIF
   (c) Splicing and connectors
   (d) Linearly polarised wave
   (e) Amplifiers used in photo-
   (f) Optical fiber fabri-