2011

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-304

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Optical Communication and Information Processing)

Answer *Q. No. 1* and any *three* questions from the rest.

1. Answer the following questions :   2×5

   (a) Distinguish between single mode and multimode fiber.

   (b) Why the two wave lengths 1.3s μm and 1.55 μm are important in case of single mode fiber optic communication system ?

(c) Give a simple explanation of band loss in optical fib transmission.

(d) What is Manchester code?

(e) Distinguish between LASER and LED in terms of the salient features.

2. Obtain an expression for numerical aperture (NA) of multimode fiber and discuss its significance.

Can it be arbitrarily increased? Why NA of single mod fiber is low in comparison to that of multimode fibe Consider a bare fiber consisting of a core of refractiv index 1.48 and having air ($n_2 = 1$) as cladding. What i the maximum incident, angle upto which light can b guided by the fiber? 4+2+2+2

3. Obtain the differential equation satisfied by the radia part of the transverse component of the electric field i a cylindrical optical fiber. What is weakly guidin approximation? Develop the solution of the complete fiel and propagation constant in terms of Bessel and modifie Bessel functions in core and cladding. Hence draw th possible field pattern of a y-polarised LP_{01} mode witl justification. 4+2+3+1

4. (a) Draw the schematic diagram of a semiconductor lase and indicate how population inversion is obtained ir

the same. Why is a laser diode enclosed within a Fabry-Perot cavity ?

(b) What is Wavelength Division Multiplexing (WDM) ? What are the advantages of WDM over other types of multiplexing ? (4+2)+4

5. What do you mean by + SLM and – SLM ? Design an optical EX–OR gate and explain its operation. Also construct a optical half-adder circuit using the optical EX-OR gate and explain its operation. 2+4+4

6. Write short notes on any *two* of the following : 5+5

  (i) Losses in optical fiber communication ;

  (ii) Time Division Multiplexing (TDM) ;

  (iii) Image edge detection and enhancement.

[Internal Assessment — 10]

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