2008

2nd Semester Examination

ELECTRONICS

PAPER—EL-1201

Full Marks : 40

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.

Write the answers Questions of each group in separate books.

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

1. Answer any *five* questions :   5×2

    (a) What do you mean by mode ? What is the difference between multimode and simple mode fiber ?

    (b) What is waveguide dispersion ?

    (c) Explain the weekly guiding approximation.

    (d) What advantages are obtained in a PIN photodiode ?

    (e) How do impurity-related transitions enhance the quantum efficiency of a LED ?

    (f) When and why physically nonlinearity is induced with the high electric field ?

    (g) Why Si is not used for making lasers and LEDs ?

    (h) What is the function of optical recorder in laser and what do you mean by open resonator ?

2. What do you mean by solid state laser? With a neat energy level diagram describe the principle of operation of ruby laser. Why one of the face of the ruby crystal is cut at the Brewster angle? 2+6+2

3. (a) What do you mean by Q-factor of a laser resonator and Q-switching?

   (b) Explain briefly what are conditions to achieve Q-switching?

   (c) What are passive and active Q-switching? Explain briefly any technique for successful Q-switching.
   (2+2)+1+(1+4)

4. Obtain an expression for numerical aperture of an optical fibre and discuss its significance. What are overfilled and underfilled conditions of launching light into an optical fibre?

   A fibre consists of a core of refractive index $n_1 = 1.48$, $a = 25\ \mu m$ and cladding of either $n_2 = 1.46$ or 1 (bare). Find out NA in the two cases why do you then not prefer air as cladding? 4+1+1+1+2+1

5. (a) What is intermodal dispersion in an optical fibre? Derive the expression of intermodal dispersion.

   (b) An optical fiber having core and cladding refractive index 1.48 ad 1.46 respectively and length 3 km. Calculate the intermodal dispersion of the fiber.
   (1+6)+3

6. Write short notes on any *two* of the following topics:
   5×2

   (a) Nd-YAG Laser.

   (b) Recording and reconstruction of object in hologram.

   (c) 2nd and 4th harmonic generation in nonlinear optics.

   (d) Avalanche Photodiode.