2016

M.Sc.

2nd Semester Examination

ELECTRONICS

PAPER—ELC-201

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.

(*Applied Optics and Opto-Electronics*)

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

1. (a) What is Kerr effect ?

(b) Why coherent light is essential in Holography ?

(c) What do you mean by waveguide dispersion ?

(d) Why nonlinearlity in refractive index occurs at highly intense electric fields when the same material is linear in low fields ?

(e) What is Q switching ? 2×5

2. (a) What is a photo diode? Derive the expression for photo-current, quantum efficiency and responsibility of a photodiode.

   (b) When 3×10^{11} photons each with a wavelength of 0·85 μm are incident on a photo diode, on average $1\cdot2\times10^{11}$ electrons are collected at the terminals of the device. Determine the quantum efficiency and responsibility of the photo diode at 0·85 μm.

   (1+2+2+2)+3

3. What do you mean by material dispersion? Derive the expression for material dispersion. Define material dispersion co-efficient. 2+7+1

4. (a) Derive an expression for numerical aperture of an optical fiber and explain its significance. What are overfilled and underfilled conditions of launching light into an optical fiber?

   (b) A multimode step index fiber with a core diameter of 80 μm and a relative refractive index difference of 1·5% is operating at a wavelength of 0·85 μm. If the core refractive index is 1·48, estimate : (i) the normalized frequency for the fiber ; (ii) the number of guided modes.

   $(4+1+2)+\left(1\frac{1}{2}+1\frac{1}{2}\right)$

5. Discuss the basic processes involved in working of LED with band diagram. What should have the specialities of good LED materials? Give an example of a good LED material. 7+2+1

6. What do you mean by a Q-factor of a laser resonator? What are active and passive Q-switching? Explain with diagram the Accousto-optec Q-switching technique. 1+2+7

[Internal Assessment — 10 Marks]