

2015

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 do you mean by internodal dispersion?
Write down the expression for it.
- (b) Why $1.33 \mu\text{m}$ and $1.55 \mu\text{m}$ are important for choosing wavelengths of propagating light signal through optical fiber?

(Turn Over)

- (c) What is a meta-stable state ?
- (d) Define Quantum efficiency and Responsivity of a photo diode.
- (e) Draw the light-current characteristics of LED.

2×5

2. (a) What do you mean by multipath dispersion in a step index optical fiber ? Derive the expression for multipath dispersion.
- (b) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47.

Determine (i) the critical angle at the core-cladding interface ; (ii) the NA for the fiber ; (iii) the acceptance angle in air for the fiber.

(2+5)+3

3. What do you mean by Holography ? What are the difference between Holography and Photography ? Discuss with necessary diagrams the reconstruction of object from a Hologram.

2+3+5

4. Draw and explain the different vibrational modes of CO₂. Discuss with diagram the operation of CO₂ laser. What is the role of N₂ in CO₂ laser ?

3+5+2

5. (a) Explain the operation of a p-i-n photo diode with a schematic diagram. What are the advantages of p-i-n photo diode over p-n junction photo diode ?
- (b) A photo diode has a quantum efficiency of 70% for photons of energy 1.52×10^{-19} J. Calculate (i) the wavelength at which the diode is operating and (ii) the optical power required to achieve a photo current of $3 \mu\text{A}$ when the wavelength of incident photons is that calculated in part (i). (5+2)+3
6. What do you mean by a switching? What is active a switching and passive a switching? Explain with diagram the rotating reflector method using mechanical shutters technique of successful a switching. 1+3+6

[Internal Assessment — 10 Marks]
