

2014

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 all questions : 2×5**
- (a) Why WDM is advantageous over other types of multiplexing?
 - (b) Construct optical 'OR' gate and explain its operator.
 - (c) Why Si is not used for making LASERS and LEDs?

(Turn Over)

- (d) What do you mean by Spatial Light Modulator (SLM) ?
- (e) What is Extrinsic Losses in optical fiber communication ?
2. (a) What are microbendings and macrobendings ? How they introduce loss of light energy in optical fiber ?
- (b) The refractive indices of the core and cladding of a step index fiber are 1.48 and 1.465 respectively. Light of wavelength $\lambda = 0.85 \mu\text{m}$ is guided through the optical fiber. Calculate the minimum and maximum values of the propagation constant β .
- (2+4)+4
3. (a) Discuss with example the NRZ, RZ and Manchester code.
- (b) How do you detect sub-merged bodies with laser ?
- (2+2+2)+4
4. (a) Explain the refractive index distribution :

$$n^2(r) = n_1^2 \left[1 - 2\delta \left(\frac{r}{a} \right)^\alpha \right]; r < a$$

$$= n_1^2 [1 - 2\delta]; r > a$$

for a graded index fiber with reference to symbols. Sketch and name the profiles with justification for $q = 1, 2$ and α .

- (b) A multimode step index fiber with a core diameter of $80\mu\text{m}$ and a relative index difference of 1.5% is operating at a wavelength of $0.85\mu\text{m}$. If the core refractive index is 1.48, estimate : (i) the V number for the fiber and (ii) the number of guided modes.

(3+3)+4

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

7+2+1

6. What are the advantages of optical logic gates over electronic gates? Design and explain the operation of an optical EX-OR gate. Hence construct a half-adder by using an optical EX-OR gate and optical AND gate.

2+4+4

[Internal Assessment -- 10]
