PG/IVS/ELC/404/24(Old)

M.Sc. 4th Semester Examination, 2024

ELECTRONICS

(Optical Communication and Information Processing)

PAPER – ELC-404(Old)

Full Marks : 50

Time : 2 hours

Answer **all** questions

The figures in the right hand margin indicate marks

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

GROUP – A

Answer any **four** questions : 2×4

1. What do you mean by perturbation in a quantum mechanical system ?

2. What do you mean by the nonlinearity of a medium ?

3. Discuss the necessity of intrinsic region in PIN photodiode.

4. What do you mean by BER ? Give its significance. 1 + 1

5. What are direct bandgap semiconductors ? In which devices are they generally used ? 1 + 1

6. What do you mean by splice loss in an optical fiber communication system ?

GROUP – B

Answer any **four** questions : 4 × 4

7. Explain the light propagation principle through an optical fiber.

8. Describe the principle of operation of a phototransistor.

9. Consider a bare fiber consisting of a core of refractive index (n_1) 1.45 and having air (n_2=1) as cladding. What is its numerical aperture ? What is the maximum incident angle up to which light can be guided by the fiber ? 2 + 2

10. Write a short note on EDFA.

11. Explain the working principle of semiconductor lasers.

12. What do you mean by TDM and WDM ? 2 + 2

GROUP – C

Answer any **two** questions : 8 × 2

13. Using time-independent perturbation theory derive an expression for second-order perturbation in energy. Discuss the physical signification of the Fermi-Golden rule in time-dependent perturbation theory. 6 + 2

14. Discuss the effects of attenuation and dispersion in optical fiber communication system. 4 + 4

15. Write a note on the point-to-point optical link design. 8

16. What do you mean by single-mode and multimode optical fibers ? Obtain an expression for the numerical aperture of an optical fiber and discuss its significance. 3 + (4 + 1)

[Internal Assessment – 10 Marks]