PART - A

Answer all questions. Each carries 2 marks:

1. Briefly explain the difference between meridional and skew ray paths in step index fibers.

2. What is meant by a graded index optical fiber? Give an expression for the possible refractive index profile.

3. Define the normalized frequency for an optical fiber and explain its use in the determination of the guided modes propagating within a step index fiber.

4. List the advantages of LED in comparison with injection laser.

5. Mention various techniques employed in lens coupling of LEDs to optical fibers.

6. What is meant by intensity modulation of an optical source?

7. Give the concept of gain clamping in relation to the operation of an SOA.

8. Define the parametric gain.


10. Define virtual concatenation.

(10 x 2 = 20 Marks)

P.T.O.
PART – B

Answer any one full questions from each Module. Each question carries 20 marks.

Module – I

11. (a) Using simple ray theory, describe the mechanism for the transmission of light within an optical fiber. Briefly discuss with the aid of a suitable diagram what is meant by the acceptance angle for an optical fiber. Show how this is related to the fiber numerical aperture and the refractive indices for the fiber core and cladding.

(b) Briefly describe linear scattering losses in optical fibers with regard to:

   (i) Rayleigh scattering
   (ii) Mie scattering.

12. (a) Briefly explain the working of

   (i) photonic bandgap fiber
   (ii) hollow core fiber.

(b) Describe with the help of simple ray diagrams.

   (i) multimode step index fiber
   (ii) single mode step index fiber.

Module – II

13. (a) Derive an expression for the responsivity of an intrinsic photodetector in terms of quantum efficiency of the device and wavelength of incident radiation.

(b) Explain the detection process in the p-n photodiode. Compare this device with p-i-n photodiode.
14. (a) Describe the mechanism giving the emission of light from laser diodes.
   
   (b) Discuss the major noise in laser diodes.

**Module – III**

15. (a) How does the frequency chirp affect the optical output signal. Explain its impact on the output signal of an optical wavelength converter employing semiconductor laser amplifier.
   
   (b) Compare different types of optical amplifiers in relation to the provision of amplification within optical fiber communication.

16. (a) Explain the principle and working of OTDR and how refractive index measurements is done using this.
   
   (b) Briefly discuss about the design of IMDD links.

**Module – IV**

17. (a) Sketch a functional block diagram for a WDM. Explain the significant role of add/drop multiplexers used in WDM.
   
   (b) Explain the working of MZ interferometer.

18. (a) Explain the formation of solitons in optical fibers.
   
   (b) Discuss the following terms
   
   (i) GH effect
   
   (ii) soliton - soliton interaction.

(4 x 20 = 80 Marks)