

Dr. Anshul Bhattaraj -

6/12/2022 (143)
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National Institute of Technology Hamirpur (HP)

End Semester Examination (December, 2022)

Subject: Optical Communication Systems and Networks (EC-412)

Semester: VII

Maximum Marks: 50

Time: 3 Hours

Note: Attempt all five questions.

1. Answer the following:
 - i) Draw and briefly explain the main blocks of optical fiber communication system.
 - ii) Draw different modes in a planer optical waveguide.
 - iii) Draw and briefly explain step index and graded index optical fibers.
 - iii) Draw optical fiber attenuation spectrum of low-water-peak optical fiber and standard single-mode optical fiber.
 - v) 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: (a) the normalized frequency for the fiber; (b) the number of guided modes. (2 X 5 = 10)

2.
 - i) Discuss different intramodal and intermodal dispersions in optical fibers. (7)
 - ii) A 6 km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate the delay difference between the slowest and fastest modes at the fiber output. (3)

3.
 - i) Draw and explain the mechanism of light emission in double heterojunction structure of LED. (7)
 - (ii) Explain the direct and indirect bandgap semiconductors. (3)

4.
 - i) With clear diagrams explain the procedure for optical amplification using EDFA. (7)
 - ii) Discuss the working of PIN and avalanche photodiodes with diagrams. (3)

5. Write short notes on **any two** of the following:
 - i) Optical connectors.
 - ii) SONET protocol in optical networks.
 - iii) Wavelength division multiplexing techniques
 - iv) Laser diode (5 X 2 = 10)