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[This question paper contains 2 printed pages.] Your Roll No. .....

Sr. No. of Question Paper:

Unique Paper Code: 2513010020

Name of the Paper: Optical Communication

Name of the course: **B.Sc. (H) Electronics**

Semester: VII

Duration: 3 Hours

MaximumMarks: 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this Question paper.
2. **Question No.** 1 is compulsory.
3. Attempt any **four** questions from **Ques. No. 2 to Ques. No. 7.**
4. All questions carry equal marks.

1. (a) What is the typical wavelength range used for optical communication?
   (b) List three advantages of optical fiber over copper cables.
   (c) What is the purpose of a preamplifier in an optical receiver?
   (d) In which region does silica fiber have minimum dispersion?
   (e) What is the difference between a laser and an LED as a light source?
   (f) What does BER stand for, and what does it indicate? (3x6 = 18)

2. (a) Explain the propagation mechanisms in optical fibers.
   (b) A multimode step-index fiber has a core refractive index of 1.45 and Δ=1%. Calculate NA and acceptance angle.
   (c) Discuss the factors affecting fiber attenuation. (6 x3 = 18)

3. (a) Describe the structure and working of an EDFA.
   (b) An optical signal at 1550 nm has an input power of 1 mW and is amplified by an EDFA with 30 dB gain. Calculate output power in mW.
   (c) Explain gain flattening in WDM system. (6x3 = 18)

4. (a) Explain the causes of dispersion in optical fibers and techniques to reduce it.
   (b) A 50 km fiber has dispersion of 2 ps/(nm·km). If a laser has a spectral width of 0.1 nm, calculate pulse broadening.
   (c) Compare PIN and APD photodiodes. (6 x3= 18)

5. (a) Explain the architecture of an optical receiver.
   (b) A PIN photodiode has responsivity of 0.9 A/W. Calculate photocurrent for -20 dBm input.
   (c) Discuss noise sources in optical receivers. (6x3 = 18)

6. (a) Describe WDM and its types.
   (b) A DWDM system has 80 channels, each 50 GHz apart. Calculate total bandwidth.
   (c) Explain the role of optical amplifiers in WDM networks. (6 x3 = 18)

7. (a) Explain the structure and working principle of a Semiconductor Optical Amplifier (SOA).
   (b) An SOA has a gain of 25 dB and a saturation output power of 10 dBm. Calculate the input power at which it starts saturating.
   (c) Describe the factors that limit the performance of an optical receiver. (6x3= 18)