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Roll No. Total No. of Pages: 02

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B.Tech.(ECE) (Sem.-7,8) OPTICAL FIBER COMMUNICATIONS

Subject Code: EC-404 Paper ID: [A0329]

Time: 3 Hrs. Max. Marks: 60

INSTRUCTION TO CANDIDATES:

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

1. Write briely:

- a. Describe BL product of WDM lightwave systems.
- b. Convert 1 µW optical power into dBm.
- c. Explain optical receiver sensitivity and give its units also.
- d. Differentiate between SBS and SRS nonlinear effects.
- e. What are the benefits of hetrojunctions used in optical sources?
- f. A single mode fiber is measured to have $\lambda^2 \left(\frac{d^2 n}{d\lambda^2} \right) = 0.02$ at 0.8 μ m. Calculate the dispersion parameter β_2 and D.
- g. What is the importance of normalized frequency? Define it.
- h. Compare characteristics of Photodiode, PIN photodiode, Avlanche photo diode
- i. A photodiode has a quantum efficiency of 50% at a wavelength of 0.9 μ m. Calculate its responsivity at 0.9 μ m, Received optical power if the mean photocurrent is 10^{-6} A, the corresponding number of received photons at this wavelength.
- j. Define spectral efficiency of WDM optical communication systems.

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SECTION-B

- 2. Explain the dispersion shifted and dispersion flatted fibers. Why do we need such fibers and how these fibers are made?
- 3. Give requirements and explain briefly some common material system used in fabrication of electroluminescent sources for optical fiber communications.
- 4. Discuss with the aid of a block diagram, the function of an optical fiber receiver. In addition, describe possible techniques for automatic gain control in APD receivers.
- 5. What is power budgeting in light wave systems? Discuss with typical expressions.
- 6. What are reasons for optical receiver sensitivity degradation?

SECTION- C

- 7. Discuss dispersion mechanisms with regard to single-mode fibers indicating the dominating effects. Hence, describe how intramodal dispersion may be minimized within the single-mode region.
- 8. Explain optical transmitter design by considering various issues and components used in it.
- 9. Explain high capacity point to point WDM lightwave systems.

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