Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ECE) (2011 Batch) / (ETE) (2011 Onwards)   (Sem.–7,8)
OPTICAL COMMUNICATION
Subject Code : BTEC-702
Paper ID : [A3001]

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 a student has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. **Write briefly :**

    a. Describe how bit rate is limited with dispersion and source spectral width.

    b. Give importance of DFB lasers used in optical transmitters.

    c. Define optical receiver sensitivity and give its units also.

    d. What do you understand by material dispersion? How it varies against wavelength for a given composition of optical fiber?

    e. Why generally III-V alloys type semiconductor materials are used in fabrications of optical sources?

    f. Give source limitations becoming obstacles in transmitter circuit design.

    g. What is the importance of normalized frequency? Define it.

    h. What are merits & demerits of preamplifiers circuits used in receiver circuits?

    i. A photodiode has a quantum efficiency of 50% at a wavelength of 0.9 μm. Calculate its responsivity at 0.9 μm, 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.

SECTION-B

2. Define attenuation coefficient. Explain material absorption fiber loss mechanism in optical Fibers.

3. What is RIN? Derive a relation of it for a laser source.

4. List and explain the recent developments in the field of optical communication. How the nonlinear effects are restricting the data rates? Explain.

5. Describe briefly speed versus sensitivity tradeoff of photo detectors.

6. Discuss light wave systems used for point to point links.

SECTION-C

7. a) Explain the concept of electromagnetic modes in relation to a planar optical waveguide. Discuss the modifications that may be made to electromagnetic mode theory in a planar waveguide in order to describe optical propagation in a cylindrical waveguide.

   b) A single mode fiber of 10 μm core diameter has a normalized frequency of 2.0. A fiber splice at a point along its length exhibits an insertion loss 0.15 dB. Assuming only lateral misalignment contribute to the splice insertion loss. Estimate the magnitude of the lateral misalignment.

8. Explain thermal noise limited optical receivers by deriving expressions of noise mechanisms introduced in it.

9. Explain multiple access WDM networks for multichannel lightwave systems.