Printed pages: 0   **Sub Code: NEC701**

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B TECH
(SEM VII) THEORY EXAMINATION 2017-18
OPTICAL COMMUNICATION

Time: 3 Hours   *Total Marks: 100*

Notes: *Attempt all Sections. Assume any missing data.*

SECTION-A

1. Attempt all questions in brief. $2 \times 10 = 20$

   a. Write down the wavelength region corresponding to first, second and third window.
   b. Write down the advantages of optical fiber communication.
   c. What is acceptance angle? Discuss its importance.
   d. Compare the spectrum of laser source and Led Source.
   e. What is difference between merdional rays and skew rays?
   f. Define iso type and aniso type heterojunction.
   g. Define mode hopping.
   h. What are the two basic requirement of optical detector?
   i. Define dark current noise.
   j. Write any two eye pattern features.

SECTION-B

2. Attempt any three of the following. $3 \times 10 = 30$

   a. What are the various advantages of optical fiber communication system?
   b. A 8 micrometer core diameter single mode fiber with a core refractive index of 2, and relative refractive index difference of 0.3% and operating wavelength 0f 1.55 micrometer. Determine critical radius of curvature. Explain bending losses.
   c. What is the different multichannel transmission techniques used in optical fiber? Describe each in brief.
   d. Derive expression of acceptance angle for skew rays. An optical fiber has numerical aperture of 0.344. What is the acceptance angle for meridional rays ?calculate the acceptance angle for skew rays which change direction by 100^0 at each reflection.
   e. Explain the working of PIN photodiode. A p-i-n photodiode has a quantum efficiency of 55% at a wavelength of 0.9 micrometer. Calculate:
      i. Its responsivity at 0.9 micrometer
      ii. The received optical power if the mean photocurrent is 10^{-8} A.
      iii. The corresponding number of received photons at this wavelength

SECTION-C

3. Attempt any one of the following: 1 × 10 = 10
   a. Explain absorption losses.
   b. A multimode graded index fiber exhibit total pulse branding of 0.1 microsecond over a distance of 10 km. Determine maximum possible bandwidth on the link assuming no inter symbol interference. Pulse dispersion per unit length and bandwidth length product for the fiber.

4. Attempt any one of the following.   1 × 10 = 10
   a. Name the material used for the fabrication of LED. What are basic requirement of optical sources to be used for optical fiber.
   b. Explain various requirement of optical detector. Explain the working principle of PIN diode.

5. Attempt any one of the following: 1 × 10 = 10
   a. Explain the analysis which carried out to measure overall performance of optical fiber. Explain link budget analysis.
   b. Explain the necessity of preamplifier in optical receiver. Mention the type's pf preamplifier and explain the working of any one of them.

6. Attempt any one of the following: 1 × 10 = 10
   a. Explain avalanche photo diode and also explain effect of temperature on avalanche gain.
   b. Explain the working of semiconductor laser. What is threshold condition for lasing action?

7. Write a note on any one of the following: 1 × 10 = 10
   a. Front end amplifier.
   b. Homodyne detection