

Seat No.	
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**T.E. (Electronics and Telecommunication) (Semester - VI)**  
**Examination, November-2017**

**Optical Communication and Networks (Revised)**

**Sub. Code : 66919**

**Day and Date : Monday, 06 - 11 - 2017**

**Total Marks : 100**

**Time : 02.30 p.m. to 05.30 p.m.**

- Instructions :**
- 1) All questions are compulsory
  - 2) Figures to the right indicates full marks.
  - 3) Assume suitable data if necessary and state it clearly.
  - 4) Planck's constant  $h = 6.626 \times 10^{-34}$ , speed of light  $c = 2.998 \times 10^8$   
charge of electron  $e = 1.602 \times 10^{-19}$

**Q1) Attempt any two of the following:**

- a) State the advantages of optical fiber communication? [18]
- b) Briefly explain the names & designations of spectral bands used for optical communication?
- c) A silica optical fiber with a core refractive index of 1.41 and relative refractive index difference of 2%. Determine
  - i) the critical angle at the core-cladding interface
  - ii) the NA for the fiber
  - iii) acceptance angle in air for the fiber

**Q2) Attempt any two of the following:**

**[16]**

- a) What are the criterion used for selecting materials for optical fibers? Explain how the addition of these material changes the refractive index profile?
- b) What are the different chemical vapor deposition process? With neat diagram explain vapor axial deposition process?
- c) 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.

**Q3)** Attempt any two of the following:

[16]

- What are the factors responsible for causing absorption in optical fiber? Explain intrinsic & extrinsic absorption?
- With the help of neat diagram Material, Waveguide & Polarization mode dispersion?
- State different types of scattering losses in optical fiber? With the help of neat diagrams explain Rayleigh & Mie scattering?

**Q4)** Attempt any two of the following:

[18]

- Explain in details effect of temperature on linearity of optical sources? How it can be compensated?
- The radiative and non-radiative recombination lifetimes of the minority carriers in the active region of a double-heterojunction LED are 60ns and 100ns respectively. Determine the total carrier recombination lifetime and the power internally generated with in the device when the peak emission wavelength is  $0.87 \mu\text{m}$  at a drive current of 40 mA.
- Compare LED & LASER.

**Q5)** Attempt any two of the following:

[16]

- Explain in detail Fundamental receiver operation?
- Derive the expression for Probability of error in digital receiver?
- A photodiode has a quantum efficiency of 65% when photons of energy  $1.5 \times 10^{-19} \text{ J}$  are incident upon it.
  - At what wavelength is the photodiode operating?
  - Calculate the incident optical power required to obtain a photocurrent of  $2.5 \mu\text{A}$

**Q6)** Attempt any two of the following:

[16]

- Explain operating principles of WDM. Write different WDM standards?
- Explain in detail Fiber Bragg grating & diffraction grating filters?
- Explain in detail WDM+EDFA performance

