

Total No. of Questions : 4]

SEAT No. :

**PB291**

[Total No. of Pages : 2

**[62701-80**

**B.E. (Electronics & Telecommunication Engineering) (Insem)**

**FIBER OPTIC COMMUNICATION**

**(2019 Pattern) (Semester-VIII) (404190)**

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4 from following questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) A step index fiber has a relative refractive index difference of 1.3% & a core refractive index of 1.5. The core diameter is 100  $\mu\text{m}$  and operating wavelength is 850nm. Assuming fiber is kept in air, calculate numerical aperture of fiber, acceptance angle and critical angle. **[6]**
- b) Compare single mode and multimode fibers. **[4]**
- c) Draw and explain optical fiber communication system showing all the key elements. Enlist the advantages of optical fibers as a communication media. **[5]**

**OR**

- Q2)** a) Explain intramodal dispersion, intermodal dispersion and overall fiber dispersion in optical fibers. **[4]**
- b) A multimode graded index fiber exhibits total pulse broadening of 0.1  $\mu\text{sec}$  over a distance of 15km. Calculate. **[6]**
- i) Maximum possible bandwidth on the link
  - ii) The pulse dispersion per unit length
  - iii) The bandwidth-length product for the fiber
- c) Describe the following losses in optical fiber. **[5]**
- i) Absorption
  - ii) Attenuation
  - iii) Scattering

**Q3) a)** Explain the following terms for semiconductor laser diodes with neat diagram [5]

- i) Absorption
- ii) Spontaneous Emission
- iii) Stimulate Emission

b) Explain working and characteristics of LED with diagrams. State its advantages and disadvantages. [4]

c) A double heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination times of 30ns and 100 ns respectively. The drive current is 40 mA Determine

- i) Bulk recombination lifetime
- ii) The internal quantum efficiency
- iii) Internal power level

[6]

OR

**Q4) a)** Explain external quantum efficiency and the external power generated in the LED with necessary equations. [6]

b) Distinguish direct and Indirect band-gap semiconductor materials. Also state the major requirements of good optical sources. [6]

c) Calculate the emission wavelength in nm of the light emitted using a semiconductor material with energy band-gap of 3eV [3]

