

**8E4090**

Roll No.

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**8E4090****B.Tech. VIII Semester (Main/Back) Examination - 2013****Electronics & Communication****8EC3 Optical Communication****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

Attempt any *five* questions, selecting *one* question from each *unit*. All questions carry *equal* marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

**Unit - I**

1. a) Write down the comparison of conventional single-mode and multimode step-index and graded index optical fibers. (8)
- b) Find the core radius necessary for single-mode operation at 1320 nm of a step-index fiber with  $n_1=1.480$  and  $n_2=1.478$ . What are the numerical aperture and maximum acceptance angle of this fiber. (8)

**OR**

1. a) What is intermodal dispersion? Derive expression for multimode step index fibre. (8)
- b) Consider a 30 km long optical fibre that has an attenuation of 0.8 dB/km 1300 nm. If 200  $\mu$ W of optical power is launched into the fibre, find the optical output power  $p_{out}$ . (8)

**Unit - II**

2. a) Describe the light source materials that are used in manufacturing LEDs. Also explain their advantage. (8)
- b) What power is radiated by an LED if its quantum efficiency is 3% and the peak wavelength is 670 nm? (8)

**OR**

2. a) Describe the LASER diode structures and radiation pattern. (8)
- b) Explain the modulation of LASER diodes. (8)

### Unit - III

3. a) Define quantum efficiency and responsivity of a photodiode. Determine the wavelength at which quantum efficiency and responsivity are equal. (8)
- b) A pin photodiode has a quantum efficiency of 50% at a wavelength of  $0.9 \mu\text{m}$ . Calculate
- Its responsivity at  $0.9 \mu\text{m}$ .
  - The received optical power if the mean photo current is  $10^{-6}\text{A}$ . (8)

### OR

3. a) Explain the structural features and working principle of a P/N photodiode. What is the functional significance of the intrinsic layer inserted in between the P and N layer. (8)
- b) What is the responsivity of an In Ga As photodiode if its quantum efficiency is equal to 70%? The energy gap of In Ga As is 0.75 eV. (8)

### Unit - IV

4. a) What are optical connectors? What are the principal requirements of a good connector design. Explain the four basic components used in optical connectors. (8)
- b) A  $8 \times 8$  star complex is used to distribute 3 dB power of a laser diode to 8 fibres. The excess loss of the complex is 2dB. Compute the power at each output fibre in dB and in mW. (8)

### OR

4. a) What are the design considerations for optical fibre systems? How the various components are chosen. (8)
- b) Explain the coarse and dense wavelength-division multiplexing. (8)

### Unit - V

5. a) Explain the time domain dispersion measurements. (8)
- b) Explain the frequency-domain intermodal dispersion measurements. (8)

### OR

5. a) Describe the measurements of fiber attenuation. (8)
- b) Describe and draw the test setup and display output for measuring chromatic dispersion by the phase-shift method. (8)