

8E4090

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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 μ 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}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 8×8 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)