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**BIELE-008**

01620

# B.TECH. IN ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

## Term-End Examination

## June, 2013

## BIELE-008 : OPTO ELECTRONICS COMMUNICATION SYSTEMS

*Time : 3 hours* *Maximum Marks : 70*

***Note :*** *Attempt **any seven** questions. All questions carry **equal** marks.*

**1.** Discuss briefly in single mode and multimode fibers. **10**

**2.** Explain the concept of electromagnetic modes in relation to a planar optical waveguide. Discuss the modification that may be made to electromagnetic mode theory in planar wave guide in order to describe optical propagation in cylindrical fiber. **10**

**3.** Define the normalised frequency for an optical fiber and explain its use in the determination of number of guided modes propagating within a step index fiber. **10**

4. A step index fiber has core refractive index 1.5, cladding refractive index 1.46. The cut- off parameter is 2.4. Find **2x5=10**

(a) core radius

(b) spot size at 50 m.

5. Find the fractional refractive index change and the largest core size for single mode propagative of a GRIN fiber having a parabolic profile with $n_1 = 1.47$ and $n_2 = 1.46$ and $\lambda = 1300$ nm. **10**

6. A multi mode step index fiber has a numerical aperture of 0.25 and a core refractive index of 1.5. The material dispersion parameter for the fiber is 200 ps $nm^{-1}$ $km^{-1}$. **2x5=10**

Determine :

(a) The total rms pulse broadening per kilometer when the fiber is used with an LED optical source having rms spectral width of 50 nm.

(b) Bandwidth length product for the fiber.

7. Discuss the LED structure, and differentiate between surface emitting LED and an edge emitting LED. **10**

8. Discuss the requirements for population inversia so that stimulated emission may dominate over spontaneous emission. Explain with the help of energy level diagram. **10**

9. Define quantum efficiency and responsivity of a photodiode. How does the responsivity depend on the quantum efficiency of the device and the wavelength of the incident radiation ? 10