M.Tech. Electronics & Communication Engineering (C.B.C.S.& C.B.S. Pattern) Sem-II

# PECS22 - Advanced Optical Communication

P. Pages : 1 **GUG/S/19/11031**

Time : Three Hours * 2 9 9 1 * Max. Marks : 70

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Notes : 1. All questions carry marks as indicated.
2. Answer **any five** questions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

**1.** a) Briefly explain the fiber classification based on modes of propagation and index profile. Draw index profile of various types of filters. **7**

b) What should be the maximum thickness of the guide slab of a symmetrical SI planar wave guide, so that it supports only the fundamental TE mode? Take, $n_1 = 3.6,\ n_2 = 3.56,\ \lambda = 0.85\mu m.$ **7**

**2.** a) What is normalised frequency of fiber? Prove that $Mg = \frac{\nu^2}{4}$ for graded index fiber. **7**

b) Explain the different types of fibers and how they are classified? **7**

**3.** a) Derive the equation for quantum efficiency of LASER. **7**

b) What are stimulated emission and spontaneous emission? Explain the principle of laser action. **7**

**4.** a) A light emitting diode emites the light having a peak wavelength of 890nm have radiative recombination time of 100ns. If the bulk recombination life time is 130ns and drive current is 14mA. Determine the non radiative recombination time. **7**

b) Draw and discuss the block diagram of optical receiver. What are the various sources of noise is the receiver. **7**

**5.** a) An optical fiber system operating at a wavelength of $1\mu m$ has a post detection bandwidth of 5MHz. Assuming an ideal detector and considering only quantum noise on the signal, determine the incident optical power necessary to active on SNR of 50dB at the receiver. **7**

b) What is avalanche photodiode receiver? Determine the factor on which avalanche photodiode receiver depends. **7**

**6.** a) Explain the term soliton interactions and discuss its role in multi wave-length channel soliton fiber system. **7**

b) Explain detail the amplification mechanism with energy level diagram in an EDFA. **7**

**7.** Discuss will the aid of suitable diagrams the measurement of dispersion in optical fibers. Consider both time and frequency domain measurement techniques. **14**

**8.** a) Describe the structure of the fiber Bragg grating assisted coupler and explain how it can effectively blocks a specific optical signal at a particular wavelength. **7**

b) Draw and discuss the functions required to build a dense WDM in optical link. **7**

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