

(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : ME28

Roll No.

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M. TECH. (Sem.II)

THEORY EXAMINATION 2015-16

OPTOELECTRONICS

Time: 3 Hours

Total Marks: 100

Note : Attempt any five questions. All the questions carry equal marks.

Assume suitable data if any missing.

1. (a) Discuss the important requirements for an optical source for use in optical communication.
- (b) Explain with relevant diagram the basic principle of confinement of carriers and optical power in the active region of a double heterojunction LED.
2. (a) What are the direct band gap and indirect band gap semiconductors? Illustrate with electron energy band diagram.
- (b) Estimate the electrical modulation bandwidth for an LED with carrier recombination lifetime of 8 ns. The frequency response of the device is assumed to be Gaussian.
3. (a) Compare the difference in performance characteristics between conventional LED used in fiber communication and super luminescent LED.

- (b) Explain with necessary diagram three process of absorption, spontaneous emission and stimulated emission in a two level energy system.
4. (a) Derive Einstein relationship connecting absorption, stimulated emission and spontaneous emission coefficients.
- (b) What do you mean by population inversion? How is the population inversion accomplished in semiconductor and non-semiconductor laser?
5. (a) Outline the reasons for adoption of the materials for the devices used for photo detection in optical fiber communications.
- (b) Explain the detection process in a p-n photodiode. Compare the device with p-i-n photodiode.
6. (a) Describe with necessary diagram the working principle of a phototransistor and give an expression for the gain G .
- (b) Give the theory of semiconductor lasers and derive an expression for the threshold current.
7. (a) Discuss the advantages of fiber optic sensors over the conventional sensors.
- (b) Explain the construction and design of fiber optic fluid level sensors.
8. (a) Explain the construction and principles of pressure and strain sensors with neat diagram.
- (b) Explain the working principle of Evanescent field absorption sensors.
