

Roll No. 

**EI - 801**  
**B.E. VIII Semester**  
 Examination, June 2015  
**Optical Instruments and Sensors**

Time : Three Hours

Maximum Marks : 70

**Note:** Total number of questions 10. Attempt any one question (including all parts) from each unit. All questions carry equal marks. Draw neat and clean circuit diagram wherever needed. Assume missing data, if any, suitably.

## Unit - I

1. a) Distinguish between optical fiber communication system and conventional communication system? And list out the advantageous and disadvantage of optical fiber communication? 8
  - b) Name the basic principle of light propagation in optical fiber. Explain in detail. 6
- OR
2. a) With the help of ray theory analysis explain what is mean by acceptance angle and numerical aperture of the fiber. Also drive their expressions. 10
  - b) What are the reasons for chromatic aberration? 4

## Unit - II

3. a) Explain different types of optical fibers with sketches and differentiate multimode and single mode fiber on their performance parameter. 8
- b) Compare the fiber structure and numerical aperture in step index and graded index fiber. 6

OR

4. a) What is attenuation in an optical fiber? List the three major causes of attenuation in an optical fiber and explain their mechanisms. 7
- b) A single Mode step index fiber has a core diameter of  $7 \mu\text{m}$  and core refractive index of 1.49. Estimate the shortest wavelength of light which allows single mode operation when the refractive index difference for the fiber is 1%? 7

## Unit - III

5. a) What are the different types of fiber optic sensors? Explain them. 7
  - b) Explain the working principle of Different types of modulator with neat sketches. 7
- OR
6. a) What is an optical sensor? State various applications of fiber optic sensors? 7
  - b) Explain the Q-Switching Technique of LASER. 7

**Unit - IV**

7. a) Describe the linear and non-linear scattering losses in optical fibers. 7
- b) What are the basic attenuation mechanisms in the optical fiber communication? Explain in brief on what factors this mechanism depends? 7

OR

8. a) What do you mean by Optical power meter? 4
- b) Explain the principle of Optical Time Domain Reflectometer (OTDR) and explain the procedure of end-to-end attenuation testing. 10

**Unit - V**

9. a) What are the requirement of photo detector and why photodiode is preferred in fiber optic communication system? 7
- b) List the photodiode parameters and differentiate between the "quantum limit" and "dark current". 7

OR

10. a) Explain stimulated emission and spontaneous emission with the help of two level energy band diagrams. 7
- b) What is the requirement for optical sources to feed into a fiber? Enlist the advantage and disadvantages of LASER and LED? 7