EI-801

B.E. VIII Semester

Examination June, 2013

Optical Instruments & Sensors

Time : Three Hours

Maximum Marks : 100 ***Minimum Pass Marks :35***

Note: Attempt any one question from each unit. All questions carry equal marks.

Unit - I

1. a) Explain transmission of light ray is an optical fiber. 10
   b) Explain the theory of optical image formation. 10

OR

2. a) Derive the relation between acceptance angle and numerical aperture. 10
   b) Explain the following terms : 10
      i) Aberration ii) Comma
      iii) Acclamation iv) Osages

Unit - II

3. a) Explain in detail signal degradation in single mode fiber due to dispertion. 10

   b) Describe the structures of different types of optical fibers with ray paths. What is the approximate diameter of an optical fiber in each case? 10

OR

4. a) Discuss model analysis of step index fiber. 10
   b) An optical signal at a specific wavelength has lost 55 percent of its power after traversing 3.5 km of fiber. What is the attenuation in dB/km of this fiber. 10

Unit - III

5. a) Discuss methods used for measurement of losses in an optical fiber. 10
   b) Explain application of optical fiber as a temperature and pressure sensors. Compare its utility with conventional sensors. 10

OR

6. a) Explain modulation techniques for sensor fibers. 10
   b) Briefly outline the principle behind the calorimetric methods used for the measurement of absorption less in optical fibers. 10

Unit - IV

7. a) Describe with necessary experimental arrangement for the measurement of the signal attenuation is an optical fiber by cutback technique. 10
   b) Explain optical switching. 10

OR

8. a) Describe the experimental setup used in optical Time Domain Reflectometer (OTDR) technique. How is the attenuation measured by this technique. 10
   b) Outline major design criteria of an optical fiber meter for use in the field. 10

Unit - V

9. a) A photodiode has a quantum efficiency of 65% when photons of energy 1.5×10^{-19} J are incident upon it.
      i) At what wavelength is the photodiode operating?
      ii) Calculate the incident optical power required to obtain a photocurrent of 2.5 μ A when the photodiode is operating as described above. 10
   b) Explain single - mode Lasers. 10

OR

10. a) Explain the working of PIN diode with diagram. Compare its performance with other types of photo detectors. 10
    b) Explain Integrated optical devices. 10

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