Total No. of Questions :5] *[Total No. of Printed Pages : 2*

Roll No .....

EI/IC - 801

B.E. VIII Semester

Examination, June 2016

Optical Instruments and Sensors

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) What is intramodal dispersion or distortion?
   b) State the principle of light propagation through an optical fiber.
   c) What is total internal reflection and explain its importance for optical communication.
   d) Derive the expression for the effective number of modes guided by a curved multimode fiber of radius 'a'.

   OR

   Explain about the ray theory for Meridional and Skew rays.

2. a) Among the different fibers which has the least dispersion.
   b) Why refractive index of cladding is less than the refractive index of core?

   c) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and a cladding refractive index of 1.47. Determine the numerical aperture and acceptance angle in air for the fiber.
   d) Explain about step index fiber structure and graded index fiber structure.

   OR

   Derive the wave equations for step-index fiber and explain.

3. a) What are permanent and semi permanent splicers?
   b) What is the basic principle of opto modulator?
   c) Explain the different lensing schemes available to improve the power coupling efficiency.
   d) Explain any two types of intrinsic fiber sensor.

   OR

   Explain the various types of fiber optic losses in detail.

4. a) What are the basic attenuation mechanisms?
   b) What causes mode coupling?
   c) Explain the principle of optical switching.
   d) Explain the principle of optical spectrum analyzer in detail.

   OR

   Explain the principle of Q-switching and mode locking.

5. a) List the important requirements of an optical receiver.
   b) What are the advantages of Gas Laser over the solid state laser?
   c) GaAs has a band gap energy of 1.43eV at 300K. Determine the wavelength above which an intrinsic photodetector fabricated from this material will cease to operate.
   d) Derive an expression for threshold gain for laser.

   OR

   What type of materials are used for optical sources? What are the advantages of double hetero structure? Compare surface emitting and edge emitting LED structures.

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