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Total Number of Pages: 2

M.TECH
EIPE108

1st Semester Regular/BACK Examination – 2015-16
FIBER OPTICS AND LASER INSTRUMENTATION
BRANCH(S): I&E
Time: 3 Hours
Max marks: 70
Q.CODE-T939

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

- Q1 Answer the following questions: (2 x 10)
- a) What do you mean by acceptance angle of an optical fiber? How it is related to numerical aperture.
 - b) What are the requirements for an optical fiber source?
 - c) Compare p-n photo diode with avalanche photodiode.
 - d) How Pyroelectric thermal detectors are used to detect light?
 - e) What is a resonator in a laser?
 - f) What do you mean by light amplification? What is the necessary condition for light amplification?
 - g) What are metastable states? Discuss their role in laser action.
 - h) Give two examples of active optical devices used to modify laser beam.
 - i) What do you mean by trimming of materials and how it is done?
 - j) How holography differs from photography?
- Q2 a) Write down different losses occur in optical fiber. Discuss the measurement of fiber scattering loss by describing the use of two common scattering cells. (5)
- b) Describe how optical fiber is used to measure force and to detect oil present in water. (5)
- Q3 a) The velocity of light in the core of a step index fiber is 2.01×10^8 m/s and the critical angle at core-cladding interface is 80° . Determine the numerical aperture and acceptance angle for the fiber. The velocity of light in a vacuum is 2.998×10^8 m/s. (5)
- b) What do you mean by dispersion? A multimode graded index fiber exhibits total pulse broadening of $0.1 \mu\text{s}$ over a distance of 15 Km. Estimate (a) the maximum possible bandwidth on the link assuming no intersymbol interference, (b) the pulse dispersion per unit length (5)
- Q4 a) What are modes and explain different types of modes in laser? (5)
- b) Differentiate between spatial and temporal coherence. (5)
- Q5 a) Why we want to control the laser output? Explain any technique to get high power pulses from a laser. (5)
- b) Compare solid lasers with gas lasers. (5)

- Q6 a) Explain how laser is used in material processing. (5)
b) How laser is used to measure distance and velocity? (5)
- Q7 a) How laser is used to remove tumours? (5)
b) Discuss the use of laser in brain surgery. (5)
- Q8 Write Short Notes (Any Two) (5 x 2)
a) Structure and principle of edge emitter LEDs
b) Electro-optic modulator
c) Obtain the relation for optimum output power for Four level laser
d) Principle of Holography