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Question Paper Code : 91479

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Seventh Semester

Electronics and Instrumentation Engineering

EI 2404/EI 74/EI 1354 A/IC 1002/10133 EI 704 — FIBRE OPTICS AND LASER INSTRUMENTS

(Common to Sixth Semester – Instrumentation and Control Engineering and Electrical and Electronics Engineering)

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the different types of optical fibres and their characteristics?
2. Distinguish between intrinsic and extrinsic absorption.
3. What are the different types of modulators?
4. List the important parameters of optical detectors.
5. Define the term mode locking.
6. Mention the functions of lidar and laser tracking.
7. State the advantages of shielding gas during material processing by lasers.
8. What are the techniques used for distance measurement using Laser?
9. Distinguish between a hologram and photographic film.
10. What are the advantages of laser surgery?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for number of modes propagating in a graded index fibre from the first principle. (8)
- (ii) The relative index difference between the core axis and the cladding of a graded index fibre is 0.7% when the refractive index at the core axis is 1.45. Estimate values for the numerical aperture of the fibre along the axis when the index profile is assumed to be triangular. (8)

Or

- (b) Describe with the aid of suitable diagram :
- (i) the multimode fiber mechanical splice
- (ii) a single mode fiber mechanical splice
- (iii) the multimode fiber splicing using a silicon chip arrays. (5 + 5 + 6)
12. (a) (i) Explain the block diagram and working principle of single mode optical fiber sensor for current measurement. (8)
- (ii) Explain the construction and working of ring interferometer with multiturn fiber coil. (8)

Or

- (b) Explain the operation of :
- (i) optical fluid level detector. (5)
- (ii) optical reflective type displacement sensor. (5)
- (iii) Moire fringe modulator of displacement measurement. (6)
13. (a) Describe for a Fabry Perot resonator laser diode, modes and threshold conditions. Obtain its rate equations for steady state output. (16)

Or

- (b) Explain the construction and operation of
- (i) ruby laser
- (ii) gas laser with neat diagram. (2 × 8)
14. (a) Describe the method for the measurement of
- (i) Acceleration and
- (ii) Current (2 × 8)

Or

- (b) Explain how laser is used in material processing and also explain laser heating process and laser trimming of material. (2 × 8)

15. (a) (i) Discuss holography for non-destructive testing. (8)
- (ii) Describe the LASER instruments for surgery and removal of tumors of vocal cords. (8)

Or

- (b) (i) Explain holography in detail. (8)
- (ii) Explain the medical applications of LASER in gynecology and oncology. (8)
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