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Question Paper Code: 31952

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

Elective

Electronics and Instrumentation Engineering

01UEI906 - LASER AND FIBRE OPTICS INSTRUMENTATION

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Give any four desirable properties of lasers.
2. List the different types of lasers based on the state of matter of the active medium. Give one example for each.
3. What are industrial lasers? Give two applications of it.
4. What are the advantages of laser welding?
5. Write any two applications of holographic interferometry.
6. What are the medical areas where laser is used for surgery?
7. Define Numerical Aperture (NA).
8. Differentiate a step index fibre from a graded index fibre.
9. Differentiate an intrinsic fibre optic sensor from an extrinsic fibre optic sensor.
10. What is the use of fibre optic gyroscope and on what effect it works?

PART - B (5 x 16 = 80 Marks)

11. (a) How is a three level laser different from a four level laser? With suitable energy level diagram, describe the construction and working of a four level laser. (16)

Or

(b) Illustrate the following phenomenon in detail:

(i) Q-switching (ii) Cavity dumping (16)

12. (a) Explain in detail how laser is used to measure the following industrial parameters:

(i) current (ii) voltage (iii) pollution. (16)

Or

(b) Describe with neat sketches the principle of laser welding, melting and trimming of materials. (16)

13. (a) (i) How is holography applied for the non destructive testing of engineering components? Explain. (10)

(ii) Describe the application of laser in vocal cord surgery. (6)

Or

(b) Explain holographic interferometry. Illustrate any two applications of it with relevant diagrams. (16)

14. (a) (i) Draw the refractive index profile of single mode step index fibre and multi mode step index fibre. (4)

(ii) A step index fibre has a numerical aperture of 0.16, a core refractive index of 1.450 and a core diameter of $90 \mu\text{m}$. Calculate,

(1) acceptance angle of the fibre (4)

(2) refractive index of the cladding (4)

(3) approximate maximum number of modes with a wavelength of $0.9 \mu\text{m}$ that the fibre can carry. (4)

Or

(b) Explain the construction and working of PIN diode and avalanche photo diode. List out their advantages, disadvantage and applications. (16)

15. (a) Explain the measurement of liquid level, length and strain using optical fibres. (16)

Or

(b) Explain the measurement of pressure, temperature and change in orientation using optical fibres. (16)