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Question Paper Code: 49506

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Electronics and Instrumentation Engineering

14UEI906 - LASER AND FIBER OPTICS INSTRUMENTATION

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- _____ is the major factor that decrease the life time of laser diode.
(a) low current density (b) aging
(c) threshold voltage (d) decrease of temperature
- When the laser output is coupled with fiber, some light will be reflected back into the laser clarity. This occurs at _____.
(a) Fiber joints (b) Reflection joints (c) Index joints (d) Non fiber joints
- While measuring the velocity of the laser, the distance "S" between fringes is denoted by
(a) $S = \frac{\lambda}{2 \sin \theta}$ (b) $S = \frac{\lambda}{2 \sin \frac{\theta}{2}}$ (c) $S = \frac{\lambda}{\sin \frac{\theta}{2}}$ (d) $S = \frac{\lambda}{\sin \theta}$
- In conduction limited melting, the shape of the melted region is in the form of hemispherical and _____ (Where dE/dt is rte of laser energy incidence and dH/dt is rate of heat conduction).
(a) $\frac{dE}{dt} < \frac{dH}{dt}$ (b) $\frac{dE}{dt} > \frac{dH}{dt}$ (c) $\frac{dE}{dt} > > \frac{dH}{dt}$ (d) $\frac{dE}{dt} < \frac{dH}{dt}$
- Which is used to store the testing data with 100 percent security?
(a) Electrocardiography (b) Electroretinography
(c) Holography (d) Electroengography

6. In medical applications, the unit used for laser treatment is
 (a) Milliwatt / cm² (b) Kilowatt / cm² (c) Megawatt / cm² (d) Nanowatt / cm²
7. _____ are the rays following zig zag path when they travel through fiber and for every reflection it will across the fibre.
 (a) skew rays (b) refractive rays
 (c) optical fibres (d) meridional rays
8. The low splice loss is _____
 (a) < 0.06 dB (b) <= 0.06 dB (c) > 0.06 dB (d) >= 0.06 dB
9. Faraday rotation is _____
 (a) $\theta_r = \mu_1 \mu_r n V I$ (b) $\theta_r = \mu_0 \mu_1 n V I$
 (c) $\theta_r = \mu_2 \mu_r n V I$ (d) $\theta_r = \mu_0 \mu_r n V I$
10. _____ sensor consists of two fibers which are connected at the base of a glass micro prism in the total internal reflection process.
 (a) Solid level (b) Gas level (c) Liquid level (d) Solid and liquid level

PART - B (5 x 2 = 10 Marks)

11. What is gas laser?
12. Mention the various types of lasers are used for material removal and vapourisation.
13. State the effect of photo thermal processes in tissues.
14. Define group refractive index of the fiber.
15. What is fiber optic gyroscope?

PART - C (5 x 16 = 80 Marks)

16. (a) Explain the basic characteristics of lasers. Derive an expression for threshold gain for laser. (16)

Or

- (b) Describe the operations of following laser in detail: (16)

- (i) Gas laser (Helium –neon) (ii) Solid laser (Nd : YAD)
(iii) Liquid laser (iv) Semiconductor laser

17. (a) Illustrate the laser for the measurement of distance, length, velocity and acceleration with neat diagrams. (16)

Or

- (b) Explain the operations of laser in material processing, heating, welding and melting in detail. (16)

18. (a) (i) Brief holography for non-destructive testing. (8)
(ii) Mention the process of selecting a tissue interaction mechanism. (8)

Or

- (b) Write short notes on laser instruments for: (16)
(i) Brain Surgery (ii) Plastic surgery
(iii) Oncology (iv) Gynecology

19. (a) Elaborate different types of fibers and their properties, with examples. (16)

Or

- (b) (i) Explain about the Optical sources and detectors (8)
(ii) Describe the working of PIN diode, with neat diagram. (8)

20. (a) (i) Educate the operations of phase modulated fiber optic sensors. (8)
(ii) How voltage and current are measured by the help of fiber optic sensor. Explain with diagrams. (8)

Or

- (b) (i) With a neat diagram, explain the fiber optic instrumentation system. (8)
(ii) Describe the working of Fiber Optic Gyroscope (FOG). (8)