

Code No: 07A62201

R07**Set No. 2**

III B.Tech II Semester Examinations, December 2010
OPTO-ELECTRONIC AND LASER INSTRUMENTATION
Electronics And Instrumentation Engineering

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain in detail about various recording and reconstruction devices of hologram.
 (b) With the help of neat sketches explain reconstruction of hologram with a wave identical to reference wave and with a wave conjugate to reference wave. [8+8]
2. (a) What are the various laser instruments used for general surgery, give their merits and demerits.
 (b) Explain in detail about laser applications in dermatology. [8+8]
3. (a) With a neat diagram explain the operation of laser endoscopy
 (b) Explain about laser heating. [8+8]
4. (a) Define numerical aperture and derive an expression for numerical aperture.
 (b) Explain about various applications of optical fibers for instrumentation. [10+6]
5. (a) Explain the 3 modes of vibration of a CO₂ laser. How population inversion can be achieved with CO₂ laser explain.
 (b) Explain different techniques used for Q-switching. [8+8]
6. (a) Explain the various noise mechanisms in photo diodes and derive expression for the signal to noise ratio for the case of direct detection using a photo diode.
 (b) An APD generates a current of 100 mA When the incident power is 5 nW The operating wavelength is 1.5 μm. Find its responsivity. If the quantum efficiency is 0.7, find the multiplication factor. [8+8]
7. (a) Differentiate between the two major categories of fiber joint.
 (b) Discuss the problem of Fresnel reflection at all types of optical fiber joint.
 (c) The Fresnel's reflection at a butt joint with an air gap in a multimode step index fiber is 0.46 dB. Determine the refractive index of fiber core. [5+5+6]
8. (a) Light is reflected from the smooth surface of water at the polarization angle. Assume $n = 1.3330$. Find
 i) The angle of incidence ii) The angle of refraction.
 (b) Explain the structure and working principle of fiber optic temperature sensor. [8+8]

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R07**Set No. 4**

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Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
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1. (a) Explain the geometry of He-Ne laser.
 (b) Explain energy-levels in He-Ne laser. [8+8]
2. (a) Explain the terms coherence requirements, resolution in connection with hologram.
 (b) With the help of neat sketches explain the recording mechanism of hologram. [8+8]
3. (a) Explain the working principle of various laser instruments used in surgery.
 (b) With necessary diagram, discuss about laser and their tissue interaction. [8+8]
4. (a) Differentiate between transducer and a sensor.
 (b) Explain how do you estimate the transmission line loss using single mode fiber optic sensor for measurement of current. [8+8]
5. Distinguish between magneto-optic and Electro-optic modulators with neat sketches. [16]
6. (a) Explain the treatment of eye surgery and treatment of cancer with lasers.
 (b) Explain the use of laser beam in finding depth of sea, and water sources in the earth. [8+8]
7. An optical fiber has a numerical aperture of 0.22 and a cladding refractive index of 1.59. Find the acceptance angle for the fiber in water which has a refractive index of 1.33. [16]
8. (a) If a cable contains more than one fiber, how might they be arranged, explain.
 (b) How must a fiber end be prepared for connection to another fiber? Explain.
 (c) How can you connect computers in a network within a room using fiber? Explain. [5+6+5]

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R07**Set No. 1**

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Answer any FIVE Questions
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1. (a) Discuss in detail about various methods available in holography.
(b) With necessary diagrams, discuss the principle of operation of holographic interferometer. [8+8]
2. (a) Distinguish between two types of laser diodes.
(b) Explain the optical and electrical characteristics of laser diode. [8+8]
3. Define dispersion. Distinguish between internal and intra modal dispersion. [16]
4. (a) Write about Q-switching devices.
(b) Distinguish between longitudinal and transverse mode locking. [8+8]
5. (a) Why are hetero junction designs used in optical sources.
(b) What operational characteristics of optical sources would effect the dispersion loss in optical fiber?
(c) What properties of optical sources would effect the attenuation loss in an optical fiber?
(d) What are the disadvantages of optical sources. [4+4+4+4]
6. (a) List out the advantages of laser weapons.
(b) What are the disadvantages in laser radar when compared with ordinary radar. [8+8]
7. (a) Write a neat diagram explain the interferometric method of measurement of length.
(b) Explain how the Moire-fring modulation fiber optic sensor helps in eliminating the instability encountered with fiber optic intensity modulated sensor. [8+8]
8. (a) Explain the method of creation of a medical hologram with neat sketch.
(b) Discuss the role of lasers in ophthalmology. [8+8]

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R07**Set No. 3**

III B.Tech II Semester Examinations, December 2010
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Electronics And Instrumentation Engineering

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain Zeeman effect in magneto optics.
(b) Explain Faraday effect in magneto-optics. [8+8]
2. (a) Discuss about structural construction of Argon laser.
(b) Write the applications of He-Ne laser. [8+8]
3. (a) Define and explain polarizing angle and brewster's law.
(b) Explain polarization by double refraction. [8+8]
4. (a) Explain role of laser in spectroscopy, merits and demerits of it.
(b) Explain the use of lasers in chemical industry. [8+8]
5. (a) Explain the structure of an optical fiber with neat sketch.
(b) Explain the propagation of light in step-index and graded index fibers. [8+8]
6. (a) Explain the electrical properties of p-n junction.
(b) List out the materials might be used to make a visible light LED.
(c) What are the three properties of laser light make it different from ordinary light.
(d) Draw the schematic view of a driver circuit for an LED. [4+4+4+4]
7. (a) In what way lasers are used for a blind man? Explain.
(b) Explain the treatment of corneal ulcers with lasers. [8+8]
8. (a) Draw the sketch for holography microscope and explain its principle of operation. Compare the image resolution of this with that of ordinary conventional microscope.
(b) Explain the recording mechanism using synthetic hologram. [10+6]
