

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING QUESTION BANK



VII SEMESTER

1907704 FIBRE OPTICS AND LASER INSTRUMENTATION

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SUBJECT : 1907704 FIBRE OPTICS AND LASER INSTRUMENTATION

SEM / YEAR : VII / IV

UNIT I - OPTICAL FIBRES AND THEIR PROPERTIES

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fibre: Total internal reflection, Acceptance angle (θ_a), Numerical aperture and Skew mode, –Different types of fibres and their properties: Single and multimode fibers and Step index and graded index fibers, – fibre characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses – Dispersion – Connectors and splicers –Fibre termination – Optical sources: Light Emitting Diode (LED), – Optical detectors: PIN Diode.

PART – A

S.No	Questions	BT Level	Competence
1	Analyse how numerical aperture is related to total internal reflection in optical fibers?	BLT-4	Analyze
2	Compare permanent and semi-permanent Splicer.	BLT-5	Evaluate
3	Discuss Snell's law of refraction.	BLT-2	Understand
4	Examine the principle involved in an optical detector.	BLT-3	Apply
5	Distinguish between intrinsic and extrinsic losses.	BLT-2	Understand
6	Define intermodal dispersion. What is its cause?	BLT-1	Remember
7	List the different types of glass fibers. Mention a potential application of each.	BLT-1	Remember
8	Discriminate Intermodal and Intramodal dispersions.	BLT-5	Evaluate
9	Generalize the necessity of cladding for an optical fibre.	BLT-6	Create
10	Generalize any two required properties of light sources used in optical fibre communication.	BLT-6	Create
11	Examine the features of Single mode Graded Index Fibre.	BLT-3	Apply
12	Define total internal reflection.	BLT-1	Remember
13	Describe the Snell's law and write the equation for critical angle.	BLT-2	Understand
14	Define Rayleigh Scattering.	BLT-1	Remember
15	Analyze the role of optical detector in fibre optics system?	BLT-4	Analyze
16	A single mode step index fiber has a relative refractive index difference of 1% and a core refractive index of 1.5. The number	BLT-2	Understand

	of modes propagating at a wavelength of 1.3 μm is 1100. Estimate the diameter of the fiber core.		
17	Define acceptance angle.	BLT-1	Remember
18	Differentiate graded index fiber and step index fiber.	BLT-4	Analyze
19	Decide among the different fibers which has the least dispersion?	BLT-3	Apply
20	List any two semi-permanent splicers. Why are they called so?	BLT-1	Remember
21	What is critical angle?	BLT-2	Understand
22	Point out the expression for Numerical aperture in the case of graded index fiber.	BLT-4	Analyze
23	Examine the V number of fiber.	BLT-3	Apply
24	Assess the relation between numerical aperture of skew rays and meridional rays.	BLT-5	Evaluate
PART B			
1	Analyze the importance of Ray optic theory and explain in detail with neat sketches. (13)	BLT-4	Analyze
2	Explain how light propagates through step index and graded index fibre. (13)	BLT-1	Remember
3	Compare and contrast all the parameters of single mode and multimode glass fibers. (13)	BLT-4	Analyze
4	Describe the different types of fibers and their properties with neat sketches (13)	BLT-2	Understand
5	Explain the signal degradation of fiber by attenuation and absorption. (13)	BLT-2	Understand
6	Explain the bending losses in optical fibers with the radiation loss at a fiber bend. Elucidate the core and cladding loss with necessary formulas. (13)	BLT-3	Apply
7	Elaborate about the various dispersion losses possible in optical fibres. Also discuss how intra modal and inter modal dispersion can be minimized. (13)	BLT-3	Apply
8	Discuss the fibre characteristics briefly and also explain how it is degrading the signal passing through it? (13)	BLT-2	Understand
9	(i) Describe the different types of dispersion in fibers. (8) (ii) Explain the need for fibre termination. (5)	BLT-1	Remember
10	(i) Explain the loss due to Rayleigh Scattering in optical fibers(7) (ii) What are linear and nonlinear scattering? Explain in detail with examples. (6)	BLT-2	Understand
11	Discuss the principles of splicing technique and illustrate the following (1) Mechanical splicing (7) (2) Fusion splicing (6)	BLT-2	Understand

12	Illustrate the different types of joints and connectors with an example and explain their properties. (13)	BLT-3	Apply
13	Enumerate and explain the optical source and optical detector with neat diagrams. (13)	BLT-4	Analyze
14	Describe the construction and working of avalanche photo diode, PIN photo diode and photo conductive detector. State its merits and demerits. (13)	BLT-2	Understand
15	Explain the following terms: Refractive index of a medium, Total internal reflection, Acceptance angle and Numerical aperture of ray optics. (13)	BLT-2	Understand
16	Compare and contrast all the parameters of step index fiber and Graded index fibers which are classified based on refractive index profile. (13)	BLT-3	Apply
17	Analyze the Meridional rays propagating in a fibre with neat diagrams and also explain the total distance travelled over a length of fibre 'L'. (13)	BLT-4	Analyze
PART C			
1	(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. (7)	BLT-5	Evaluate
2	What is ISI in Optical fibers? Derive an expression for rms pulse broadening in a Multimode glass fiber due to intermodal dispersion. (15)	BLT-6	Create
3	What are the general requirements considered while selecting a light source for fibre optic link? Explain about the construction and working of photomultiplier Tubes used as optical source in fibre communication. (15)	BLT-5	Evaluate
4	Describe with the aid of suitable diagram. (15) (i) The multimode fiber mechanical splice. (ii) A single mode fiber mechanical splice. (iii) The multimode fiber splicing using a silicon chip arrays.	BLT-5	Evaluate
5	Elucidate how the performance of mechanically coupling the fibres and aligning the cores of fibres is achieved for the light to pass. (15)	BLT-5	Evaluate

UNIT II-INDUSTRIAL APPLICATION OF OPTICAL FIBRES

Fibre optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fibre Optic Sensor and Displacement sensor (Extrinsic Sensor) – Fibre optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) –Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

PART – A

S.No	Questions	BT Level	Competence
1	Differentiate intrinsic and extrinsic fibre optic sensor.	BLT-2	Understand
2	Summarize about the significance of polarization maintaining fibers in optical communication.	BLT-2	Understand
3	Obtain any two industrial applications of an optical fibre.	BLT-3	Apply
4	Describe about fibre optic instrumentation system.	BLT-1	Remember
5	Classify the different types of modulators.	BLT-4	Analyze
6	What is Farady rotation?	BLT-1	Remember
7	Examine acoustic optic modulator.	BLT-3	Apply
8	Examine the need of Moire fringes and how are they formed.	BLT-3	Apply
9	Classify the different types of fiber optic sensors.	BLT-4	Analyze
10	What is the basic principle of electro optic modulators?	BLT-1	Remember
11	List the features of magneto optic modulators.	BLT-2	Understand
12	Draw the block diagram of fibre optic communication system.	BLT-1	Remember
13	Generalize the principle of Proximity sensor.	BLT-6	Create
14	How the direct modulations broaden the spectral line width of the laser diode?	BLT-5	Evaluate
15	Generalize the need for modulation.	BLT-6	Create
16	How optical beam polarization achieved in external modulators?	BLT-5	Evaluate
17	Point out the main cause of degradation of the optical signal at the input of the modulator.	BLT-4	Analyze
18	State any two industrial applications of optical fiber.	BLT-1	Remember
19	Describe Pockels effect.	BLT-2	Understand
20	What is Speckle pattern?	BLT-1	Remember
21	What is Pockels effect?	BLT-4	Analyze
22	Analyze Kerr effect.	BLT-3	Apply
23	Examine polarization effect.	BLT-5	Evaluate
24	Define Moire fringes.	BLT-2	Understand

PART-B

1	With the help of OTDR display diagram, explain how measurement of attenuation and fiber length is done using Optical time Domain Reflectometry. (13)	BLT-1	Remember
2	Explain how optical fibers are used as Displacement, Position and Level sensors. (13)	BLT-3	Apply
3	Examine and explain the principle and working of any two types of fibre optic sensors. (13)	BLT-3	Apply
4	Explain the working principle of fiber optic instrumentation used in the measurement of attenuation with a neat sketch. (13)	BLT-4	Analyze
5	(i) Examine the principle of interferometric method of measurement of length. (7) (ii) Obtain the method of measurement of temperature using optic fibre optic sensors. (6)	BLT-3 BLT-3	Apply
6	What is the role of optical fibers in the measurement of pressure? Describe in detail. (13)	BLT-1	Remember
7	Point out the working principle of Electro optic modulator with a neat sketch. (13)	BLT-4	Analyze
8	Describe the construction and principle of working of cut back method for the measurement of attenuation. (13)	BLT-2	Understand
9	(i) Discuss the different micro bending sensors and their basic principles in detail. (7) (ii) Give an account on “Moire Fringes”. (6)	BLT-1	Remember
10	(i) Explain a Michelson interferometer used for high resolution displacement measurement. (10) (ii) Categorize the importance of fringe shifting. (3)	BLT-4	Analyze
11	Describe the operation of optical pressure sensor and optical temperature sensor which works on the principle of reflection concept, transmission concept, micro bending concept and phase modulation type. (13)	BLT-2	Understand
12	(i) Describe the fibre optics instrumentation system for the measurement of strain. (7) (ii) Explain different applications of modulators used in fiber optic instrumentation system. (6)	BLT-1 BLT-1	Remember
13	Analyze the features of fiber optic sensors and point out the uses in the measurement of current and voltage. (13)	BLT-4	Analyze
14	Discuss in detail the working of any three types of modulators. (13)	BLT-6	Create
15	Discuss the Fiber Scattering loss Measurement in detail with neat diagrams. (13)	BLT-2	Understand
16	Examine the Absorption Measurement in fiber optic instrumentation system in detail. (13)	BLT-3	Apply
17	Analyze the Fiber dispersion measurements by End reflection method and Near field scanning techniques in detail. (13)	BLT-4	Analyze

PART-C			
1	Explain the significance of fibre optic sensor used in dispersion measurement in detail. (15)	BLT-5	Evaluate
2	Construct a fibre optic sensor with the method of polarization technique. (15)	BLT-6	Create
3	Write short notes on the operation of the following (i) Optical fluid level detector. (5) (ii) Optical reflective type displacement sensor. (5) (iii) Moire fringe modulator of displacement measurement. (5)	BLT-5	Evaluate
4	Give the theory of fibre optic modulators and discuss its advantages. (15)	BLT-6	Create
5	Elucidate the importance of fiber optic instrumentation system in the industrial application of optical sensors. (15)	BLT-6	Create

UNIT III-LASER FUNDAMENTALS			
<i>Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.</i>			
PART –A			
Q.NO	Questions	BT Level	Competence
1.	Analyze how population inversion is achieved for Laser Generation?	BLT-4	Analyze
2.	List the characteristics of laser.	BLT-1	Remember
3.	Draw the energy level diagram of a four level laser system.	BLT-2	Understand
4.	Define the term mode locking.	BLT-1	Remember
5.	Classify the different classes of lasers.	BLT-4	Analyze
6.	What is mean by Mode locking? Explain its need in laser generation.	BLT-3	Apply
7.	State the important features of Nd-YAG laser.	BLT-1	Remember
8.	Examine why optical pumping is preferred in lasers?	BLT-3	Apply
9.	Examine Double hetero structure Laser.	BLT-3	Apply
10.	How four level laser is better than three level laser?	BLT-5	Evaluate
11.	Generalize the significance of pumping in lasers.	BLT-6	Create
12.	Justify why population inversion cannot be achieved in a system under thermal equilibrium.	BLT-5	Evaluate
13.	Define the term population inversion.	BLT-1	Remember

14.	Analyse how the modulation rate of the laser diode is increased?	BLT-4	Analyze
15.	Define LASER.	BLT-1	Remember
16.	Discuss the advantages and disadvantages of solid state laser.	BLT-2	Understand
17.	Generalize the properties of LASER.	BLT-6	Create
18.	Describe about cavity damping.	BLT-2	Understand
19.	Define “Q-switching”.	BLT-1	Remember
20.	Describe the principle of electron beam pumping.	BLT-2	Understand
21.	Point out the characteristics of stimulated emission.	BLT-4	Analyze
22.	Why gain guided lasers are not in practice?	BLT-3	Apply
23.	Pump wavelength is shorter than the laser wavelength. Justify?	BLT-5	Evaluate
24.	Give the characteristics of spontaneous emission.	BLT-2	Understand

PART B			
1	Discuss about the Resonator configuration of a laser setup. (8) (ii) Differentiate 3 level lasers from four level lasers systems. (5)	BLT-2	Understand
2	Write short notes on (i) LIDAR. (6) (ii) Laser Tracking. (7)	BLT-1	Remember
3	Classify lasers and explain the construction and working of semiconductor laser. (13)	BLT-4	Analyze
4	With the help of an energy diagram, analyze how four level laser system is advantageous to three level laser system .Also explain the construction and working of a four level laser. (13)	BLT-4	Analyze
5	Examine the construction and operation of solid state lasers with neat diagram. (13)	BLT-3	Apply
6	(i) Differentiate between direct and indirect band gap semiconductors. Give Examples. (6) (ii) Describe the structure of multiplication of signals inside a cavity with a neat diagram. (7)	BLT-2 BLT-2	Understand
7	With neat diagram explain the working of arc excited gas laser.(13)	BLT- 1	Remember
8	Explain the process of Q Switching in laser system. (13)	BLT- 5	Evaluate
9	(i) Describe the Characteristics of Lasers. Derive an expression for threshold gain for laser. (7) (ii) With the help of diagram explain the principle of three level and four level lasers. (6)	BLT-1	Remember
10	Discuss the construction and working of carbon dioxide laser. (13)	BLT-2	Understand
11	(i) Write technical notes on (13) (1) Laser modes (2) Frequency Chirping.	BLT-1	Remember
12	(i) Explain in detail about the steps involved in the generation of laser. (6) (ii) Compare the merits and demerits of gas laser with solid laser and liquid laser. (7)	BLT-3	Apply

13	Explain the process of mode locking in laser system. (13)	BLT-2 BLT-2	Understand
14	Explain about Q switching and Cavity damping in lasers. (13)	BLT-1	Remember
15	Illustrate the operation of liquid laser with neat diagrams and energy band sketches. (13)	BLT-2	Understand
16	Describe the working principle of He-Ne gas laser with a neat diagram. (13)	BLT-3	Apply
17	Discuss about different types of hetero structures of a semiconductor laser. State the merits and demerits of each structure. (13)	BLT-4	Analyze
PART-C			
1.	Compare a homo junction laser with hetero junction laser based on the electron beam principle. (15)	BLT-5	Evaluate
2.	Design a Fabry Perot resonator laser diode, having modes and threshold conditions also obtain its rate equations for steady state output. (15)	BLT-6	Create
3.	Compile the different laser operating modes used for the generation of Ultra short pulses. (15)	BLT-6	Create
4.	Explain the working principle of Ruby laser with a neat diagram. Derive an expression for threshold gain for laser. (15)	BLT-5	Evaluate
5.	Explain the working principle of dye laser dissolved at a concentration of one part in ten thousand with a neat diagram. (15)	BLT-5	Evaluate

UNIT IV- INDUSTRIAL APPLICATIONS OF LASER

Laser for measurement of distance, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal.

PART –A

Q.NO	Questions	BT Level	Competence
1.	Classify the common types of lasers used for material processing.	BLT-3	Apply
2.	List the merits of Laser Heating.	BLT-1	Remember
3.	Write any two industrial applications of laser.	BLT-3	Apply
4.	Define laser vaporization.	BLT-1	Remember
5.	What are the uses of shielding gas during material processing by lasers?	BLT-1	Remember
6.	Apply the techniques used for distance measurement using Laser.	BLT-3	Apply
7.	Give the advantages of using laser in industry.	BLT-2	Understand
8.	What is a laser rangefinder?	BLT-1	Remember
9.	Discuss about laser melting.	BLT-2	Understand
10.	Rewrite the significance of trimming of materials by lasers.	BLT-6	Create
11.	What type of atmospheric effects can be measured using laser?	BLT-1	Remember

12.	Identify which type of laser is preferred for material processing and Give reasons.	BLT-4	Analyze
13.	Classify the different modes of laser heating.	BLT-4	Analyze
14.	How can laser be used to measure velocity?	BLT-1	Remember
15.	Assess which type of materials oxidation cutting is preferred? Why?	BLT-5	Evaluate
16.	Illustrate the industrial application laser	BLT-2	Understand
17.	Point out the application of laser trimming and welding.	BLT-4	Analyze
18.	Discuss laser action. What are the conditions to achieve it?	BLT-2	Understand
19.	Summarize the merits and demerits of laser welding.	BLT-6	Create
20.	Why population inversion is significant in lasers?	BLT-5	Evaluate
21.	What is laser cutting?	BLT-2	Understand
22.	Analyze laser hardening.	BLT-4	Analyze
23.	Assess the mechanism of interaction between the laser beam and the processed material?	BLT-5	Evaluate
24.	Classify the types of LIDAR.	BLT-3	Apply

PART-B

1.	Describe about Laser Doppler Velocimetry for Fluid velocity and acceleration measurement. (13)	BLT-2	Understand
2.	Write the principle involved in the design of resistors, capacitors and other electronic equipment using lasers. (13)	BLT-1	Remember
3.	Analyze the role of laser for industrial measurements and explain anyone in detail. (13)	BLT-4	Analyze
4.	Give the theory of material processing and explain the trimming of materials by laser. (13)	BLT-2	Understand
5.	Describe the principle of lasers for measurement of length and velocity with neat block diagram. (13)	BLT-1	Remember
6.	Illustrate the applications of laser with examples in (i) Heating. (7) (ii) Vaporization. (6)	BLT-3	Apply
7.	Categorize and explain how the current and distance can be measured by using laser. (13)	BLT-4	Analyze
8.	(i) How voltage can be measured using laser? (7) (ii) Explain briefly laser melting (6)	BLT-2	Understand
9.	List the different modes of laser welding process. (13)	BLT-1	Remember
10.	(i) Construct a basic atom interferometry and explain the concepts involved. (9) (ii) Explain briefly the principle in LIDAR. (4)	BLT-6 BLT-6	Create
11.	Examine the industrial application of LASER in Material processing. (13)	BLT-3	Apply
12.	Describe the apparatus used for laser drilling and explain its working. (13)	BLT-2	Understand
13.	How will you measure the voltage and distance by using laser? Explain. (13)	BLT-4	Analyze

14.	Explain in detail the measurement of acceleration and velocity of a smooth surface and rough surface plates using laser. (13)	BLT-3	Apply
15.	With a neat schematic structure explain the operation of a laser trimming system. (13)	BLT-2	Understand
16.	Explain the operation of atmospheric effect in laser. (13)	BLT-4	Analyze
17.	Examine the accurate measurement of distance using FM Interferometer. (13)	BLT-3	Apply
PART-C			
1.	Explain the principle of laser for the measurement of cold atom interferometry. (15)	BLT-6	Create
2.	Calculate the faraday rotation in degree for the silica whose Verdet constant is $4 \text{ rad m}^{-1}\text{T}^{-1}$ and $u_r = 1$ and $n = 10$ turns. There is a current flow through the conductor whose value is 30 A. (15)	BLT-6	Create
3.	Explain how the laser is used in material processing, heating, welding and melting. List out the specification and the type of laser used for these applications. How the power requirement for these applications are calculated? (15)	BLT-5	Evaluate
4.	Assess the different steps involved in laser materials processing. (15)	BLT-5	Evaluate
5.	Discuss the mechanism of laser-based removal of solid surface with a thin oxide or undesirable layer. (15)	BLT-6	Create



UNIT V- HOLOGRAM AND MEDICAL APPLICATIONS

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image–Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

PART –A

Q.NO	Questions	BT Level	Competence
1.	What modification is required in a Hologram to be used as sensors?	BLT-6	Create
2.	List the types of laser used in Brain Tumor Treatment.	BLT-1	Remember
3.	Discuss the principle involved in holographic interferometry.	BLT-2	Understand
4.	Distinguish between hologram and photographic film.	BLT-2	Understand
5.	Summarize the advantages of laser surgery.	BLT-6	Create
6.	Illustrate the precautions to be followed while handling Lasers for clinical applications.	BLT-3	Apply
7.	Describe the components of Hologram.	BLT-1	Remember
8.	Examine the principle of HNDD.	BLT-3	Apply
9.	Compare Oncology and Gynecology.	BLT-4	Analyze
10.	Classify the uses of laser in medicine.	BLT-3	Apply
11.	Point out the limitations of photographic film compared to hologram.	BLT-4	Analyze
12.	List any three lasers and their main use with respect to medical field.	BLT-1	Remember
13.	How holograms are classified?	BLT-5	Evaluate
14.	Analyze why carbon dioxide laser is preferred in surgery?	BLT-4	Analyze
15.	Summarize about wave front reconstruction.	BLT-5	Evaluate
16.	Outline the advantages of laser in plastic surgery.	BLT-2	Understand
17.	State the procedure in the removal of tumors in vocal cords using laser.	BLT-1	Remember
18.	Describe the basic principle of holographic reconstruction.	BLT-2	Understand
19.	State the changes that take place during laser-cell interaction.	BLT-1	Remember
20.	List the safety issues of laser in medical surgery.	BLT-1	Remember
21.	What are endoscopes?	BLT-2	Understand
22.	Assess PDT.	BLT-4	Analyze
23.	How are lasers used during cancer surgery?	BLT-5	Evaluate
24.	Which laser is used to treat actinic keratosis?	BLT-3	Apply

PART-B

1.	Analyze the principles of holographic interferometry and its application in Non-destructive Testing of materials. (13)	BLT-4	Analyze
2.	Examine the need of holography and compare holography with commercial photographic techniques and explain in detail. (13)	BLT-3	Apply

3.	Examine the medical applications of LASER in gynaecology. (13)	BLT-3	Apply
4.	Classify the methods of holography and explain each method in detail with suitable diagrams. (13)	BLT-4	Analyze
5.	Explain how laser is used for Brain surgery with neat diagrams. (13)	BLT-5	Evaluate
6.	Summarize the spectral features and conditions involved in holography for NDT. (13)	BLT-2	Understand
7.	Explain any two medical applications of laser. (13)	BLT-5	Evaluate
8.	(i) Describe the advantages and potential applications of holography. (7) (ii) Describe the principle of holographic recording and reconstruction. (6)	BLT-1 BLT-1	Remember
9.	Describe the techniques involved in PDT and explain in detail. (13)	BLT-1	Remember
10.	What are the uses of LASER in the field of medicine and explain in detail also state the precaution to be considered while using laser in the field of medicine. (13)	BLT-2	Understand
11.	Give an account of laser surgery instruments which are used in plastic surgery and gynaecology. (13)	BLT-2	Understand
12.	(i) Examine the working of holographic optical elements with a neat diagram. (9) (ii) Assess how laser is used for removal of vocal cards. (4)	BLT-3	Apply
13.	Write technical note on (i) Laser based Microsurgery. (7) (ii) Endoscopes. (6)	BLT-1	Remember
14.	(i) What is the advantage of using LASER in the field of medicine compared with the other older techniques? (5) (ii) Describe the photocoagulation of ocular tissues done in retina. (8)	BLT-2	Understand
15.	Explain how laser is used for plastic surgery with neat diagrams. (13)	BLT-5	Evaluate
16.	Examine the medical applications of LASER in oncology. (13)	BLT-3	Apply
17.	Explain the medical application of laser in IRLS scanning with neat diagrams. (13)	BLT-4	Analyze

PART - C

1.	Compile a detailed report on real time hologram, double exposure hologram and time average hologram, Also compare and state its applications. (15)	BLT-6	Create
2.	Develop a 3D image using the different holographic procedures used in the non-destructive Testing of Engineering components. (15)	BLT-6	Create
3.	Interpret the different stages involved in the capturization of 3D image with suitable diagrams. (15)	BLT-6	Create
4.	Explain how the data is transmitted and recovered in the Holographic memory or data storage system. (15)	BLT-5	Evaluate
5.	Elucidate the working principle of modulated beam holography with neat schematic. (15)	BLT-6	Create