DEPARTMENT OF BIOMEDICAL ENGINEERING

FOL

QUESTION BANK

UNIT-I

PART-A

1. Explain the difference between Biomedical Optics & Biomedical Photonics (BMP).
2. Write short notes on Classical and Quantum theories of light in physics.
3. Write short notes on Radiation Transport theory.
4. List out the fundamental optical properties of tissues & the parameters used to quantify them.
5. Define Index of Refraction.
6. Define Reflection and Refraction in terms of refractive index.
7. What is Fresnel reflection?
8. Explain the Diagnostic and Therapeutic applications of Scattering & Absorption with examples.
9. Define Scattering Cross Section & Describe How will you define the angle of Scatter?
10. Define Scattering Coefficient & Scattering mean free path.
11. How will you classify Scattering based on the size of the scattering object relative to the wavelength of incident light?
12. Write short notes on the following.
    a. Rayleigh limit.
    b. Mie regime.
    c. Geometric limit.
    d. Raman scattering.
13. Define Electronic Transition & Absorption Band.
14. Explain about the three basic types of absorption process.
15. Define Absorption Cross Section & Absorption Coefficient.
16. What is Beer-Lamberts Law Give its relations.
17. Write short notes on the following.
    a. Luminescence.
    b. Fluorescence.
    c. Phosphorescence
18. List out the refractive indices of various important tissues of medical interest.
19. Explain Scattering by Sub-Cellular Organelles.
20. Write short note on Mitochondria's Scattering property.
21. What is Therapeutic Window?
22. What are the factors that determine the light interaction with tissues?
23. What are the material properties related to light interaction with tissues?
24. Define coherent light and incoherent light in terms of interference.
25. Give & Explain the methods of optical diagnosis and Spectroscopy.
26. Write short notes on Photo thermal & Photo chemical Reactions.
27. Define Auto fluorescence.
28. Explain about Intrinsic & Extrinsic Fluorescence.
29. Write Short notes on Subjective & Objective Speckles

PART-B

1. Define & Describe the Fundamental Optical Properties.
2. With neat diagram explain the absorption spectra for biological tissues.
3. With necessary Equations & Relations Explain the Coefficient of Absorption & Scattering.
4. Explain with a Schematic representation, The Laser interaction with Biological tissues.
5. Explain in detail the absorption process of laser light by Biomolecules.
6. With neat diagram Explain the different Scattering functions.
7. Write in detail about principle of fluorescence.
8. Write briefly about light interaction with eye tissues.
9. Explain in detail about multiphoton fluorescence.
10. Explain in detail, the Absorption properties of the Following:
    a. Nucleic Acid
    b. Amino acids and Proteins
    c. Melanin
    d. Blood & Hemoglobin
    e. Water
    f. Skull

UNIT-II

PART-A

1. What is meant by Spectrophotometry?
2. What are the major factors to be considered for the selection of a spectrophotometer?
3. Write the principle of optical filter
4. What are the components of a basic spectrophotometer?
5. Write short notes on Spectrophotometer for phosphorescence.
6. List out the different types of Spectroscopic Measurements.
7. Name two high pressure arc lamps.
8. What is the output range of the high pressure arc lamps?
9. What is meant by solid state detectors?
10. Define: monochromator
11. What is a polarizer?
12. Write the medical application of spectrophotometer.
13. List out the instruments work under the principle of absorption.
14. What is a LED? How it functions?
15. What is population inversion?
16. What is pumping?
17. What is total internal reflection?
18. Sketch the structure of optical fiber and indicate its parts.
19. Give examples for various Excitation Light Sources.
20. Explain about the CW mode & Pulse Mode of Lasers.
21. How will you classify Gas Lasers based on Active medium used, Justify your answer with suitable Examples.

22. How will you convert the CW laser into Pulsed Laser.
23. Give the function of grating monochromator
24. Give the operational principle of a semiconductor laser.
25. What is an avalanche photodiode?
26. What is Charge–Coupled Device?
27. How will you classify Filters based on Operating Principle used, Justify your answer with suitable Examples.
28. What is a Photo Multiplier Tube?
29. What are tunable dye lasers?

PART-B

1. Explain the Instrumentation involved in the Absorption, Scattering (Elastic & Inelastic) & Emission Spectrophotometers.
2. With suitable examples explain in detail about the High pressure Arc lamps & its Care & Maintenance.
3. Explain in detail about spectroscopic measurements?
4. Explain in details about various types light sources used in spectroscopy.
5. Write in detail about various types of detectors used in Spectrophotometry.
6. Write short notes on
7. Monochromator
8. Optical filters
9. Write short notes on Polarizer
10. Medical applications of spectrophotometers
11. What is the principle of LASER? Explain stimulated absorption, spontaneous emission and stimulated emission.
12. Write in detail about different types of LASERs.
13. Write in detail about Time resolved and phase resolved detection methods.
14. Explain the construction and working of CCD.

UNIT-III

PART-A

1. What are the most commonly used lasers in Biomedical Photonics?
2. What are advantages of using laser in Medical Photonics?
3. What is Laser Scalpel?
4. Write Short notes on laser Ablation?
5. Explain about Laser Coagulation.
6. Write short notes on benefits of laser tissue welding.
7. What is photochemical welding?
8. Write 2 application of laser welding in ophthalmology.
9. Define phtothermolysis.
10. Name the different mechanisms of Tissue welding.
11. What are 3 types of laser surgery of IRIS?
12. What is laser Iridotomy?
13. What is laser mydriasis?
14. What are the different types of lasers used in otolaryngology?
15. What is stenosis?

16. Write any 2 application of laser in urology.
17. What are the benefits of laser tissue welding?
18. Give the limitations of laser tissue welding.
19. Write short notes on Laser assisted Uvulo-Palatoplasty.
20. List out the types of Laser used in Otolaryngology
21. Write short notes on Port-wine stain
22. Write short notes on Hemangioma
23. What are Nevomelanocytic Nevus
24. What are the expected Skin hazards that can occur when exposed to Laser?
25. List out the ANSI Classification of Lasers.

PART-B

1. Explain the mechanism of laser tissue welding.
2. Explain the mechanism of laser tissue soldering.
3. Explain the laser surgery of posterior segment of eye.
4. Write in detail about principle & application of laser in otolaryngology.
5. Write in detail about principle & application of laser in urology.
6. Explain the laser surgery of cornea.
7. Explain the application of laser in dermatology.
8. Explain the laser surgery of the anterior segment of eye.
9. Describe the microscopic applications of Laser in Otolaryngology.
10. Explain in detail about skin optics and Laser-skin interactions.

UNIT-IV

PART-A

1. Define hologram.
2. List out the types of hologram.
3. Give examples for light sources used for holography.
4. Differentiate transmission hologram and reflection hologram.
5. What is meant by holographic data storage?
6. Explain about the data storage in holography.
7. Write a short note on digital holography.
8. Explain the Hygiene's Principle.
9. What is an Interference of Two wave?
10. How will you differentiate the Constructive interference from Destructive Interference?
11. Explain how Data are stored in a hologram.
12. What is meant by wavefront?
13. What is meant by wave let?
14. Write down about the formation of Spherical wave front.
15. List out some recording materials for holography.
16. Why a planar wavefront is some times Spherical in Nature?
17. Explain how the planar wave front is originated.
18. Define the term Interference patterns.
19. What is meant by optical hologram?
20. How will you create interference patterns?

21. What is Air wedge?
22. What are the laws governing the interference of waves?
23. List out some application of hologram.
24. Draw the constructive interference of two waves.
25. Define coherence of two waves.

PART-B

1. What is a hologram? Explain in detail about various types and recording procedures of hologram.
2. Write in detail about materials used to record the hologram and reconstruction procedure of holographic images.
3. Explain in detail about the Hygiene's Principle
4. Write in detail about wave front propagation, sensors and reconstruction techniques.
5. Explain in detail about Interference patterns in hologram.
6. Explain how optical holography is used in Medical Data Security.
7. Write in detail about principle and application of hologram.
8. What is the principle of superposition of waves? Explain the interference of waves.
9. What is holography? Explain the construction and reconstruction of a hologram.
10. Explain how optical holography is used in Mass Data Storage.

UNIT-V

PART-A

1. What is meant by near field imaging?
2. What is near field optical microscopy?
3. What are the Different modes for near-field scanning optical microscopy:
4. Name some near field imaging techniques used in biological structure identification.
5. How the near field optical probes does are Fabricated?
6. List out the System Components for In Vitro Clinical Diagnostic Instrumentation
7. What is Fluorescence Anisotropy?
8. What is Chemiluminescence
9. Define Guided Wave Optical Sensors
10. What are the advantages of near field imaging?
11. Write Short notes on in-vitro Imaging.
12. Write Short notes on in –vivo Imaging.
13. List out some invitro diagnostic methods of biological samples.
14. What is principle of fluorescent spectroscopy?
15. Write Short notes on Near field Raman Spectroscopy.
16. Write Short notes on Near field Raman Spectroscopy of labeled DNA.
17. What is "Apertureless" Near-Field Microscopy?
18. Define Multiphoton Near-Field Microscopy
19. Write the medical application of fluorescent spectroscopy.
20. What is photo radiation therapy?
21. What is Photosensitizer?
22. What is the use of Photofirin in PDT?

23. Give some examples of photo sensitizers.
24. Write how Early Stage Lung Cancer is detected?
25. Name some diseases which are effectively treated by photodynamic therapy.

PART-B

1. Explain in detail about the principle and medical application of near field imaging techniques
2. Explain the Basic Principles of Near-Field Optical Microscopy & its Instrumentation.
3. Write in detail about various types of invitro clinical diagnostic methods.
4. Explain in detail about the Investigation of cell materials using NSOM.
5. Explain the principle and instrumentation of fluorescent spectroscopy.
6. Explain in detail about the photo radio therapy.
7. What is spectroscopy? Write in detail about any one of the methods.
8. Explain the Methodology of Clinical Photodynamic Therapy
9. Explain how Photodynamic Therapy is used as Adjuvant Treatment
10. What are the different Photo sensitizers used and explain how they are used?