DHANALAKSHMI SRINIVASAN ENGINEERING
PERAMBALUR
DEPARTMENT OF BIOMEDICAL ENGINEERING
MEDICAL OPTICS
Part A

Unit-1

1. Define refractive index.
2. What are the properties involved in tissue?
3. Define optics.
4. Define absorption.
5. Define refraction.
6. Give two example of refraction.
7. Define fluorescence.
8. Define speckles
9. Explain light interaction with tissues.
10. Define optothermal interaction.
11. What is scattering.
12. Give the types of scattering.
13. Give the energy equation for luminescence.
14. Give the features of optothermal interaction.
15. How the optical properties of light is described.

Unit-2

1. Mention the instrumentation for absorption measurements.
2. Mention the instrumentation for scattering measurements.
3. Mention the instrumentation for emission measurements.
4. Give some examples of excitation light sources.
5. Write notes on high pressure arc lamp.
6. What are solid-state leds.
7. Define laser.
8. What are the principle of laser production.
9. Mention the properties of laser.
10. Name some optical filters.what do you mean by polarisers. Give example.
11. What are solid state detectors.

12. What are gratings.
13. What are monochromators.
14. Tabulate the various types of laser, wavelength and its application.
15. What are the time and phase resolved detectors.
16. Give the medical application of laser.
17. Define population inversion.
18. Define polarizer.

Unit-3

1. Draw the graph of wavelength Vs absorbance of hemoglobin, water, and melanin.
2. Give notes on skin optics.
3. Discuss laser skin interactions.
4. What are two factors that influence the laser resurfing.
5. What are three basic requirements of selective photothermolysis.
6. What do you mean by photomechanical interaction in laser.
7. Discuss the laser surgery of cornea.
8. What are the pathophysiologic considerations in laser surgery of posterior segment of the eye.
9. What are the five broad categories of short pulse tissue coagulation.
10. Name some optical filters
11. What are types of laser used in medical field?
12. Which laser is used for surgery of the cornea?
13. List any 2 treatment takes place in ophthalmology.
14. List any 2 treatment takes place in urology
15. List any 2 treatment takes place in laser tissue welding.
16. List the mechanism of laser tissue welding.
17. What are the chromophores present in skin.
18. What are the 3 basic effects takes place in laser skin interaction?
19. Why co2 laser is extensively used for surgical applications?
20. In the treatment of retinal detachment what type of laser is used and why?
21. What are the limitations of deuterium arc lamps?
22. What are the important properties of a solid state detector?

23. State the unique properties of laser?
24. State the technical specifications of laser used in medicine and in industry
25. What type of lasers are mainly used in ophthalmology?
26. Ruby and co2 lasers are mainly used in the clinical side for what applications respectively. Why?

Unit-4

1. Define optical hologram.
2. List the types of hologram.
3. What are the classifications of hologram?
4. Define interference.
5. Define wavefronts.
6. Define interference pattern.
7. List some medical application of hologram.
8. What are the components required to record hologram.
9. Give the difference between ordinary light and hologram.
10. List down the properties of hologram.
11. Write down the principle of an optical hologram.
12. Clinical laboratory instruments make use of holograms in what way?

Unit-5

1. What is near field imaging?
2. Give the features of near field imaging.
3. What is the principle involved in fluorescent spectroscopy?
4. Give the medical application of photo dynamic therapy.
5. What are the requirements of photodynamic therapy.
6. Define photosensitizer.
7. Define fluroscent spectroscopy.
8. Define vibrational relaxtion.
9. Give the medical application of fluroscent spectroscopy
10. Define in-vitro clinical diagnostic instrumentation.
11. Give the medical application of in-vitro clinical diagnostics.

12. What is near field imaging? State its features.
13. What is the principle of fluorescent spectroscopy?
14. List any 2 types of treatment carried out by otolaryngology?

Part B

Unit-1

1. i) with a experimental setup explain the measurement of scattering of tissues.
   ii) what time resolved and phase resolved detectors.
2. How is light transported into the tissue?

i) What are the effects of light interaction with tissues? Discuss.

ii) Thermography is based on what properties of light? Explain.

3. i) outline the photon transport theory to explain the optical property of tissues.
   ii) what are the optical properties of the tissues that can be measured.
4. with experimental setup explain the following measurement for the tissues:
   a. absorption of light
   b. scattering of light
   c. emission of light

Unit-2

1) Explain the instrumentation for absorption measurements.
2) Discuss the Raman spectrophotometer in detail.
3) Explain the principle, theory & instrumentation of emission measurements.
4) Discuss various excitation light sources.
5) Write short notes on:
   high pressure arc lamp.
   Optical filters.
6) Explain the solid state LEDs
7) Write short notes on:
   Polarisers
   Time and phase resolved detectors.
8) Give the characteristic features of absorption spectrophotometry

9) Compare the meaning of time resolved and phase resolved detectors

Unit-3

1. Explain in detail about the use of lasers in tissue welding.
2. Write about various applications of lasers in dermatology.
3. Discuss in detail about,
   laser in ophthalmology
   laser in otolaryngology
   laser in urology
4. List down the various types of laser used in the clinical side and their specific domain application.
5. explain in detail about application of laser in tissue welding
6. explain in detail about application of laser in urology.
7. explain in detail about application of laser in dermatology.
8. Give the clinical applications of lasers in urology and supplement why is it so successful in painless surgery?

Unit-4

1. i) explain the principle of operation of optical holographic interferometer.
   ii) how hologram is classified. State the applications of hologram.
2. i) explain the operation of time average holographic interferometer.
   ii) state the holographic optical components and their applications
3. i) compare the features of solid state LED and laser.
   ii) explain the process of near field imaging in vitro clinical diagnostic.
4. i) what are the properties employed in hologram.
   ii) explain in detail about precaution and requirements for recording a hologram.

Unit-5

1.i) what is the function of optical filter.
ii) explain the process of near field imaging of biological structure.

2.Enumerate the applications of optical holography in the medical side.

3 Explain the special technique used for near field imaging of biological structure.

4. Write brief notes on

   i) Photodynamic therapy ii) Fluorescent spectroscopy.