

Roll No.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2023

BIOMEDICAL ENGINEERING
VII Semester
BM5012 & MEDICAL OPTICS
 (Regulations 2019)

Time: 3hrs

Max. Marks: 100

CO 1	Comprehend and appreciate the significance and role of this course in the present contemporary world.
CO 2	Demonstrate knowledge of the fundamentals of optical properties of tissues.
CO 3	Describe surgical applications of laser.
CO 4	Describe photonics and its therapeutic applications.
CO 5	Apply the concepts of laser and light to understand the laser safety procedures.

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
 (Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	List the characteristics of LASER light.	2	1	L1
2	Define polarizer. State its need.	2	1	L2
3	A fiber has refractive index of 1.4 for the core and 1.2 for the cladding. Calculate the critical angle.	2	2	L3
4	The aortic wall has an absorption coefficient of 2.3 cm^{-1} and a scattering coefficient of 340 cm^{-1} at 612nm. Calculate the optical albedo of the tissue and what does the result signify?	2	2	L3
5	Differentiate LASIK and LASEK procedures.	2	3	L2
6	List the characteristics of Nd:YAG Lasers. Mention any two of its biomedical applications.	2	3	L1
7	Differentiate time domain and frequency domain OCT methods.	2	1	L2
8	What is the principle of LIF imaging?	2	1	L1
9	List the LASER safety Hazard classifications with an example for each.	2	5	L2
10	Define phototherapy. List its applications in the field of dermatology.	2	4	L1

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the construction and the various processes of lasing mechanism with neat illustration.	13	1	L2
OR				
11 (b) (i)	Explain fluorescence and phosphorescence phenomena using Jablonski diagrams.	7	1	L2
(ii)	What are optical tweezers? Explain its principle of operation with neat illustration.	6	1	L2

12 (a) (i)	Demonstrate in detail the various thermal interaction mechanisms of laser light with tissue.	13	2	L3
OR				
12 (b) (i)	Brief how absorption phenomenon influences the interaction of light energy with biological tissues using necessary equations.	7	2	L3
(ii)	Compare the three types of source-detector measurement schemes employed in a spectroscopic instrument.	6	2	L3
13 (a) (i)	Describe laser tissue welding. Explain its mechanism and types in detail with neat illustration.	13	3	L2
OR				
13 (b) (i)	What are the LASERs used for treating dental hard tissue problems. Brief an application using one of them.	7	3	L2
(ii)	Demonstrate the application of LASER in the treatment of any one retinal disorder.	6	3	L2
14 (a) (i)	Explain the principle and working of Optical coherence tomography. Brief any one application.	13	1	L2
OR				
14 (b) (i)	Explain the set-up of a holographic system with neat illustration.	7	1	L2
(ii)	With necessary equations, describe LASER speckle contrast imaging.	6	1	L2
15 (a) (i)	Explain the principle and mechanism of PDT. Discuss an oncological and non-oncological application.	13	4	L1
OR				
15 (b) (i)	Elucidate the mechanism of Low-Level Laser Therapy. Discuss any two applications.	13	4	L1

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Design a photonic instrument for a biomedical application with the detailed explanation of its every single block with an example.	15	1	L3

