ADDITIONAL CONTROLLER OF EXAMINATIONS
AU
CHENNAI
600 025

Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2025

BIOMEDICAL ENGINEERING
VIII Semester
BM5012 & Medical Optics
(Regulations 2019)

Time: 3hrs Max.Marks: 100

CO1	Explain the concepts of photonics interaction with tissues.
CO2	Demonstrate knowledge of the fundamentals of optical properties of tissues.
CO3	Describe surgical applications of laser.
CO4	Describe photonics and its therapeutic applications.
CO5	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	Draw the Jablonski diagrams for fluorescence and phosphorescence phenomena.	2	1	L2
2	Differentiate the light sources, LEDs and LASERs.	2	1	L2
3	State Beer-Lambert law and one of its biomedical applications.	2	2	L2
4	List the important characteristics of LASERS that make them attractive in the biomedical field.	2	2	L2
5	Define the types of tissue welding.	2	3	L1
6	List the LASER applications in the otolaryngology speciality.	2	3	L1
7	State the principle of elastography.	2	4	L2
8	What is the mechanism in FLIM measurements?	2	4	L3
9	A 5 mW laser makes a 2 mm by 3 mm spot on a wall. Find the irradiance. What does the result signify based on its safety aspect?	2	5	L4
10	List the non-beam hazards of LASERS.	2	5	L2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the principle and construction of the concept that is defined by the statement 'Acceleration and trapping of particles by radiation pressure'. Brief any one biomedical application.	8	1	L3
(ii)	Calculate angle of refraction for given values n_{inc}=1.51, n_{ref}=1.50, ϕ_{inc}=39°. Describe the scenario with a neat illustration.	5	1	L3
	OR			
11 (b) (i)	Describe the concept of polarization and the working of polarizers applicable to any one biomedical application.	8	1	L3
(ii)	The voltage across the leads of a red LED used in pulse oximeter is being measured as 1.71 Volts. Find the corresponding energy required to light the LED. Given: q=-1.6 x 10^{-19}	5	1	L3
12 (a) (i)	Explain the mechanism and any one biomedical application of	13	2	L3

	laser tissue interaction that has the maximum exposure time of greater than 1 sec and power density of 1mW/cm^2			
	OR			
12 (b) (i)	Explain the principle and working of a mechanism of light that results in a clean-cut incision when applied to biological tissues.	**13**	2	L3
13 (a) (i)	Discuss any three types of LASERS and their applications in dentistry.	**13**	3	L3
	OR			
13 (b) (i)	Explain the concept and principle of excimer laser and describe any one ophthalmic procedure that uses it.	**13**	3	L3
14 (a) (i)	With neat illustration, explain the principle and working of Optical Coherence Tomography (OCT). Brief on any one diagnostic application of OCT highlighting its advantages over other imaging modalities.	**13**	4	L2
	OR			
14 (b) (i)	With necessary equations and block diagram, describe the principle and mechanism of LASER speckle contrast imaging. Brief any one biomedical application.	**13**	4	L2
15 (a) (i)	Enumerate the classification of LASERS according to their power levels.	**8**	5	L3
(ii)	An appropriate LASER protective eyewear is chosen based on a higher optical density value. Justify this based on an example.	**5**	5	L3
	OR			
15 (b) (i)	Discuss any two oncological applications of a procedure that works based on class 4 lasers.	**8**	5	L3
(ii)	Briefly describe the light sources used in phototherapy for the treatment of any two dermatological conditions.	**5**	5	L3

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Explain the mechanisms of laser tissue interaction that occur at temperatures less than or equal to 100°C with neat illustrations and equations wherever necessary.	**10**	1	L4
(ii)	A procedure uses class 3B lasers that work on low-level laser light for therapy. Brief its principle and elucidate any one ophthalmology application.	**5**	5	L4

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