RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL/MAY 2024

BIOMEDICAL ENGINEERING
VI Semester
BM5602 & Radiological Equipment
(Regulation 2019)

Time:3hrs Max.Marks: 100

CO1	Discuss the principle and working of various radiography equipment
CO2	Explain the tomography concept and image reconstruction techniques
CO3	Describe the basic principle and working of Magnetic resonance imaging technique
CO4	Explain the concept of nuclear imaging techniques and radiation detectors
CO5	Demonstrate the effects of radiation, radiation safety and the principle of Radio therapy techniques

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	Define Line focus principle.	**2**	1	1
2	Explain the significance of road map mask in DSA.	**2**	1	2
3	Give the differences between 1G & 2G scanners in-terms of scan time and image quality.	**2**	2	4
4	Find the attenuation coefficient of unknown tissue when the CT number is 70HU.($\mu_{water} = .2$)	**2**	2	3
5	Determine the Larmor frequency of hydrogen nuclei placed in a 7T MRI scanner	**2**	3	3
6	What is meant by spin- echo in MRI?	**2**	3	1
7	Why Technetium-99m is the most commonly used radio active tracer in nuclear imaging?	**2**	4	2
8	Write notes on GM counter.	**2**	4	2
9	Give the applications of linear accelerator.	**2**	5	1
10	In PET scanners, how does PMTs affect image resolution?	**2**	5	2

PART- B (5x 13=65Marks)

Q. No.	Questions	Marks	CO	BL
11 (a)	Sketch out the differences of various modes of subtraction in DSA.	**13**	1	4
	OR			
11 (b)	Demonstrate the key differences of CCD, CMOS and TFT based radiography systems.	**13**	1	4
12 (a)	(i) The source–detector apparatus of a 1G scanner takes 0.25 s to rotate one angular increment and moves linearly at a speed of 1.0 m/s over a FOV of diameter 0.75 m. Determine the scan time for 720 projections. What is the scan time for a 2G scanner having nine	**7**	2	3

		detectors spaced 0.5◦ apart?			
	(ii)	Describe the working principle of 5th and 6th generation CT scanners.	**6**	2	2
		OR			
12 (b)	(i)	A 6G CT scanner has a patient table which moves at a speed of 1 cm/s. The x-ray source detector apparatus rotates at a speed of 4π radians per second. It takes 1 ms to measure a projection. (a) What is the pitch of the helix? (b) How many projections does the system measure over a 2π angle? (c) How long does it take to do a 30 cm torso scan?	**7**	2	3
	(ii)	Elaborate Fourier slice theorem.	**6**	2	2
13 (a)	Explain briefly how slice selection is performed in MRI.		**13**	3	2
		OR			
13 (b)	Discuss in detail fMRI.		**13**	3	2
14 (a)	Briefly explain the construction and working of Anger camera.		**13**	4	2
		OR			
14 (b)	Write notes on the different modes of radioactive decay, their characteristics and applications.		**13**	4	2
15 (a)	Compare and contrast Stereotaxic Radiosurgery and Stereotaxic Radiotherapy.		**13**	5	4
		OR			
15 (b)	Compare and contrast film Badges, Thermo-Luminescent and electronic dosimeter		**13**	5	4

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16.	Considering the integration of AI technology in radiology, how would you evaluate its efficacy in improving treatment planning, diagnostic accuracy and efficiency compared to traditional methods?	**15**	4	4