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**ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)**

**B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024**

**BIOMEDICAL ENGINEERING**  
**VI Semester**  
**BM5602 & Radiological Equipment**  
 (Regulations 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 (10 x 2 = 20 Marks)**  
 (Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Differentiate Characteristic and Bremsstrahlung radiations.	2	1	L2
2	Tungsten is the most preferred anode material in X-ray tubes. Justify the statement.	2	1	L2
3	Define the principle of tomography.	2	2	L1
4	Compare back projection and iterative methods of image reconstruction techniques.	2	2	L2
5	Write the significance of Larmor frequency of H <sub>2</sub> nuclei.	2	3	L2
6	Differentiate between T1 and T2 relaxation time.	2	3	L2
7	Define the operation principles of SPECT and PET techniques.	2	4	L2
8	Mention the purpose of GM counter.	2	4	L1
9	List any two effects each for direct and indirect radiation.	2	5	L1
10	What is cyber knife?	2	5	L1

**PART- B (5 x 13 = 65 Marks)**

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the principle and working of X-Ray machine with neat illustration.	13	1	L2
<b>OR</b>				
11 (b) (i)	Elaborate Digital subtraction Angiography and its various modes of subtraction.	8	1	L2
(ii)	Briefly describe an application.	5	1	L2
12 (a) (i)	Describe Fourier slice theorem.	8	2	L3
(ii)	When the region of interest is projected with 4 angles, the total attenuation coefficient in 0° is [6 21 18], 90° is [16 17 12], 45° is [10 19 10] and 135° is [14 15 6]. Using iterative reconstruction method, find the individual attenuation coefficients.	5	2	L3
<b>OR</b>				
12 (b) (i)	Explain in detail the features of 1 <sup>st</sup> to 7 <sup>th</sup> generation CT scanners.	13	2	L3

13 (a) (i)	Elaborate on the principle and working of fMRI.	13	3	L3
<b>OR</b>				
13 (b) (i)	Describe in detail the formation of spin echo in MRI.	13	3	L3
14 (a) (i)	Explain the construction and working of Gamma camera with neat illustration.	13	4	L2
<b>OR</b>				
14 (b) (i)	Describe in detail the characteristics of various modes of radioactive decay. Also, give their applications	13	4	L2
15 (a) (i)	Discuss the need for radiation protection. Describe how the radiation protection is achieved.	13	5	L3
<b>OR</b>				
15 (b) (i)	Write short notes on various radiation measuring instruments.	13	5	L3

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

Q. No	Questions	Marks	CO	BL
16. (i)	Explain the principle and working of a most recent innovation in using non-invasive radiation therapy to treat tumors in the brain.	10	5	L3
(ii)	Briefly elucidate the role of AI in enhancing the diagnosis and treatment outcome.	5	5	L4

