Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, December 2024

Course: GE Module on X Ray and CT

Semester : 5th

Program: B.Tech Biomedical Engineering

Duration : 3 Hours

Course Code: HSBE 3003_3 **Max. Marks: 100**

Instructions: Attempt all the questions. Use of non-programmable scientific calculator in permitted.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	What do you mean by tomography?	**1.5**	**CO4**
Q2	The dual source CT is advantageous over the single source counterpart at controlled dosage. Is this statement true or false?	**1.5**	**CO4**
Q3	The pressure inside the X-ray tube is maintained between $10^{-6} - 10^{-8}$ atm. Is this statement true or false?	**1.5**	**CO2**
Q4	Which compartment model gives accurate analysis in a DEXA scan? (a) 1 compartment (b) 2 compartment (c) 3 compartment (d) 4 compartment	**1.5**	**CO3**
Q5	DEXA utilizes multiple X-Ray beams of different energies. Is this statement true or false?	**1.5**	**CO3**
Q6	Which of the following occurs during X-ray-matter interaction? a. Absorption b. Penetration	**1.5**	**CO1**

	c. Scattering d. All of the above		
Q7	Which of the following is true for X-Rays? a. they are electromagnetic longitudinal waves b. they are electromagnetic transverse waves c. they are mechanical transverse waves d. they are mechanical longitudinal waves	**1.5**	**CO1**
Q8	Define Z score in a DEXA scan.	**1.5**	**CO3**
Q9	DEXA scan gives detailed analysis of bone mass density. Is this statement true or false?	**1.5**	**CO3**
Q10	The X-Ray absorption capability of bones is -20 HU. Is this statement true or false?	**1.5**	**CO4**
Q11	Pair production occurs during diagnostic imaging process. Is this statement true or false?	**1.5**	**CO1**
Q12	Define differential absorption.	**1.5**	**CO2**
Q13	Define radiographic opacity.	**1.5**	**CO2**
Q14	The focal spot size does not affect diagnostic image quality. Is this statement true or false?	**1.5**	**CO2**
Q15	Inherent filtration is sufficient to ensure X-Ray radiation protection. Is this statement true or false?	**1.5**	**CO2**
Q16	The percentage of grey matter and white matter in the brain is respectively: a. 30% and 70% b. 40% and 60% c. 60% and 40% d. none of the above	**1.5**	**CO4**
Q17	Which kind of anode is mostly used in the X-Ray tube?	**1.5**	**CO2**
Q18	Define half value layer of X-Ray beam.	**1.5**	**CO1**
Q19	The ALARA concept is implemented to ensure radiation protection during diagnostic imaging. Is this statement true or false?	**1.5**	**CO2**
Q20	What is the wavelength range of X-Rays?	**1.5**	**CO1**
Section B **(4Qx5M=20 Marks)**			

Q 1	Describe the process of generation of X-rays with the help of a suitable diagram.	**5**	**CO1**
Q2	Write a short note on the importance of and type of results obtained from a DEXA scan.	**5**	**CO3**
Q3	Describe the various detectors which are implemented in CT scan.	**5**	**CO4**
Q4	Consider a situation where the focal spot film distance (FFD) is 100 cm, which results in X-ray intensity I_o at the detector film. What will be the new X-ray intensity if the FFD is increased to 200 cm?	**5**	**CO2**
Section C **(2Qx15M=30 Marks)**			
Q 1	Discuss the various generations of CT scan instrument. Which generation according to you would be suitable for high resolution diagnostic imaging?	**12+3 = 15**	**CO2**
Q2	(a) Explain coherent and incoherent scattering of X-Rays. (b) Calculate the maximum Compton shift of an X-Ray photon after it collides with an electron.	**10+5 = 15**	**CO1**
Section D **(2Qx10M=20 Marks)**			
Q 1	Discuss the importance of radiation protection while performing X-Ray imaging.	**10**	**CO4**
Q2	Explain the operation of a DEXA scan equipment.	**10**	**CO3**