


Name:			
Enrolment No:			
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	The dual source CT employs two pairs of source-detector assembly at 90°. Is this statement true or false?	1.5	CO4
Q2	What do you mean by tomography?	1.5	CO4
Q3	The pressure inside the X-ray tube is greater than 10 ⁻¹⁰ atm. Is this statement true or false?	1.5	CO2
Q4	Define osteoporosis.	1.5	CO3
Q5	DEXA utilizes two X-Ray beams of different energies. Is this statement true or false?	1.5	CO3
Q6	The rotating anode is composed of 90% tungsten and 10% rhenium. Is this statement true or false?	1.5	CO1
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 T score in a DEXA scan.	1.5	CO3

Q9	DEXA scan gives early indication of bone fracture possibilities. Is this statement true or false?	1.5	CO3
Q10	The X-Ray absorption capability of grey matter is between 30 – 40 HU. Is this statement true or false?	1.5	CO4
Q11	Soft X-rays are characterized by energy greater than 5 – 10 keV. Is this statement true or false?	1.5	CO1
Q12	Define differential absorption.	1.5	CO2
Q13	Rectification is not essential in X-Ray tube. Is this statement true or false?	1.5	CO2
Q14	Define radiographic opacity.	1.5	CO2
Q15	Inherent filtration is insufficient 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	Stationary anode is mostly preferred in X-Ray tubes. Is this statement true or false?	1.5	CO2
Q18	Define maximum permissible dose.	1.5	CO1
Q19	The kVp and mAs settings help in controlling radiation dosage. Is this statement true or false?	1.5	CO2
Q20	X-Rays do not lead to biological changes in the body. Is this statement true or false?	1.5	CO1
Section B (4Qx5M=20 Marks)			
Q 1	Describe the photoelectric effect 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	What are the factors affecting contrast resolution in CT scan?	5	CO4
Q4	Calculate the percentage of X-ray beam absorbed by a bone of thickness 5 cm and mass attenuation coefficient of 0.7 cm ² /gm. Assume density of the bone is 2.2 gm/cm ³ .	5	CO2
Section C			

(2Qx15M=30 Marks)			
Q 1	Discuss the construction of the X-Ray tube.	15	CO2
Q2	(a) Explain coherent and incoherent scattering of X-Rays. (b) Calculate the minimum Compton shift of an X-Ray photon after it collides with an electron.	10+5 = 15	CO1
Section D			
(2Qx10M=20 Marks)			
Q 1	Explain the basic factors which influence image quality in CT scan.	10	CO4
Q2	Explain the operation of a DEXA scan equipment.	10	CO3