Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Sixth Semester

Biomedical Engineering

CBM355 - Medical Imaging Systems

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Mention the principle of X-ray absorption and its importance in medical imaging.	UN	1	2
2.	List the role of the collimator in an X-ray machine.	UN	1	2
3.	Illustrate how spiral CT scanning differs from conventional CT scanning.	AP	2	2
4.	Compare the different generations of CT scanners based on their technology.	AP	2	2
5.	Define the process of precession in Magnetic Resonance Imaging (MRI).	RE	3	2
6.	Summarize the role of Radio Frequency coils in MRI systems.	UN	3	2
7.	Show how a Gamma camera works in nuclear imaging.	UN	4	2
8.	Differentiate between SPECT and PET imaging techniques.	AP	4	2
9.	List two recent techniques used in radiation therapy and briefly describe their advantages.	UN	5	2
10.	Identify key radiation protection principles used in medical settings.	RE	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Describe how different tissues absorb X-rays differently, leading to image contrast.	UN	1	7
		ii	Explain how X-ray absorption affects the quality of diagnostic images.	UN	1	6
			Or			
	b	i	Explain the role of discrete digital detectors in modern X-ray imaging.	UN	1	7
		ii	Describe how image intensifiers are used in fluoroscopy for enhanced imaging.	UN	1	6
12.	a	i	Describe how the back-projection method is used in CT image reconstruction.	UN	2	7
		ii	Explain the iterative reconstruction method and its advantage in image accuracy.	UN	2	6
			Or			
	b	i	Explain the significance of ultra-fast CT scanners in emergency imaging.	UN	2	7
		ii	Describe the advantages of spiral CT scanners over conventional systems.	UN	2	6

13.	a	i	Apply the concepts of precession and rotation to explain how MR signals are generated.	AP	3	7
		ii	Explain how the interaction of nuclei with a static magnetic field produces magnetic resonance.	AP	3	6
			Or			
	b	i	Demonstrate the functionality of MRI system components.	AP	3	7
		ii	Apply the principles of gradient magnetic fields to explain spatial encoding in MRI imaging.	AP	3	6
14.	a	i	Explain how scintillation detectors are used in detecting gamma radiation.	AP	4	7
		ii	Apply the principles of ionization chambers in measuring radiation levels.	AP	4	6
			Or			
	b	i	Demonstrate how PET imaging is utilized in detecting cancerous tissues.	AP	4	7
		ii	Apply the principles of SPECT to explain its use in brain imaging.	AP	4	6
15.	a	i	Analyze the working principles of a linear accelerator used for cancer treatment.	AP	5	7
		ii	Discuss the importance of beam collimation in ensuring precise radiation delivery.	AP	5	6
			Or			
	b	i	Analyze the role of dosimeters and film badges in protecting medical personnel.	AP	5	7
		ii	Discuss the principles of radiation protection and how they minimize risks to patients.	AP	5	6

*PART – C (Marks 1*15 = 15)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
16.	a	i	Analyze how T1 and T2 relaxation times affect tissue contrast in MRI imaging.	AN	3	8
		ii	Discuss the impact of relaxation time differences on the diagnostic accuracy of MRI for different tissue types.	AN	3	7
			Or			
	b	i	Compare the performance and use cases of permanent, electromagnet, and superconducting magnets in MRI.	AN	5	8
		ii	Analyze how the choice of magnet influences image resolution, system cost, and operating conditions.	AN	5	7