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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (R) Examinations April 2026 (2024 Scheme)

Course Code: PEMRT412

Course Name: Biomedical Instrumentation

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Explain the significance of the 'Electrode-Skin Interface' in biomedical recording.	CO 1	(3)
2	How 'Action Potentials' propagate along a nerve fiber or muscle cell, and mention one factor affecting propagation speed?	CO 1	(3)
3	Draw a simple block diagram of an ECG machine and explain its components.	CO 2	(3)
4	Describe the application and significance of Phonocardiography in biomedical instrumentation.	CO 2	(3)
5	Explain the basic principles of X-ray generation.	CO 3	(3)
6	What is nuclear medicine imaging? Give examples of techniques used.	CO 3	(3)
7	What are the primary physiological effects of an electric current passing through the human body?	CO 4	(3)
8	Define leakage current in medical electronic equipment?	CO 5	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

			CO	Marks
9	a)	Explain the fundamental principles of biomedical instrumentation with proper block diagram.	CO 1	5
	b)	Describe the mechanism of **Propagation of Action Potentials** along a nerve fiber.	CO 1	4

10	a)	Compare **Micro, Needle, and Surface electrodes** based on their contact area, invasiveness, and the type of physiological information they provide.	CO 1	5
	b)	Explain the **Electrode-Skin Interface** using an equivalent electrical circuit model. Discuss how the half-cell potential affects signal quality.	CO 1	4
		Module -2		
11	a)	Explain the concept of the Einthoven Triangle in detail. Describe how the three bipolar limb leads are derived and their orientation relative to the heart.	CO 2	5
	b)	Explain the "10-20 System" for placing electrodes on the head.	CO 2	4
12	a)	What is an ECG? Explain the meaning of the P, QRS, and T waves in a standard heartbeat diagram.	CO 2	5
	b)	Explain the physiological origin of the heart sounds. How does a Phonocardiogram (PCG) provide information that a stethoscope cannot?	CO 2	4
		Module -3		
13	a)	Explain the major components and the instrumentation of a CT scan system.	CO 3	5
	b)	What is Fluoroscopy? Explain its working principle and how it differs from a standard X-ray picture.	CO 3	4
14	a)	Explain the fundamental principle and working of MRI (Magnetic Resonance Imaging).	CO 3	5
	b)	Discuss the advantages and limitations of CT scanning compared to conventional X-rays.	CO 3	4
		Module -4		
15	a)	Explain the working principle, block diagram, and clinical applications of an internal cardiac pacemaker.	CO 4	5
	b)	Discuss the different types of artificial heart valves, their materials, and the hemodynamic requirements for a successful implant.	CO4	4
16	a)	Explain the principle of operation of a DC defibrillator with a neat block diagram and discuss the importance of synchronization.	CO 5	5
	b)	Compare macroshock and microshock hazards in a clinical environment.	CO 5	4

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