Reg. No.															

Question Paper Code	13942

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Electrical and Electronics Engineering

20EEEL705 - MEDICAL INSTRUMENTATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The resting potential of a typical neuron is approximately: (a) +70 mV (b) –70 mV (c) +90 mV (d) 0 mV	1	K2	CO1
2.	Which of the following electrodes is most suitable for single-unit recording? (a) Surface (b) Needle (c) Microelectrode (d) Plate	1	K1	CO1
3.	Einthoven's triangle is related to which biomedical signal? (a) EMG (b) EEG (c) ECG (d) ERG	1	K2	CO2
4.	The instrument used to check leakage current in biomedical equipment is: (a) Multimeter (b) Safety analyzer (c) Defibrillator (d) Oscilloscope	1	K2	CO2
5.	Which of the following measures the lung volume and capacities? (a) Spirometer (b) Oximeter (c) ECG (d) Defibrillator	1	K1	CO3
6.	The normal pH value of human blood is approximately _____. (a) 6.8 (b) 7.0 (c) 7.4 (d) 7.8	1	K2	CO3
7.	The detector in a CT scanner measures _____. (a) Reflected light (b) Attenuated X-rays (c) Sound waves (d) Magnetic field strength	1	K2	CO4
8.	The frequency range of ultrasound used in medical imaging is _____. (a) 1–10 Hz (b) 2–15 MHz (c) 100–500 Hz (d) 1–5 GHz	1	K2	CO4
9.	The electrical pulses generated by a pacemaker are used to stimulate the _____. (a) Lungs (b) Heart muscles (c) Kidneys (d) Brain	1	K1	CO5
10.	The principle of dialysis is based on _____. (a) Filtration (b) Diffusion and osmosis (c) Evaporation (d) Ionization	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Differentiate between resting potential and action potential.	2	K2	CO1
12.	State the common problems encountered during bio-electric recording.	2	K1	CO1
13.	Mention the purpose of the 10–20 electrode system in EEG.	2	K1	CO2
14.	List the precautions to avoid electrical shock hazards in a hospital environment.	2	K1	CO2
15.	Give the normal value of pH, pCO2, pO2 in human blood.	2	K1	CO3
16.	Point out the normal heart rate of human being according to age group.	2	K2	CO3
17.	What is ultrasonic Tomographic technique?	2	K1	CO4
18.	Draw the block diagram of a bio-telemetry system.	2	K1	CO4
19.	Classify the types of pacemaker based on modes of operation of the pacemakers.	2	K2	CO5
20.	Name few tests performed using audiometer.	2	K1	CO5
21.	What is the basic principle of a muscle stimulator?	2	K1	CO5
22.	State Einthoven's law.	2	K1	CO2

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the origin and propagation of bio-potentials in excitable tissues with suitable diagrams.	*11*	*K2*	*CO1*
		OR			
	b)	Compare surface, needle, and microelectrodes along with their equivalent circuits.	*11*	*K2*	*CO1*
24.	a)	Describe the 10–20 electrode system used in EEG recording. Compare differences between unipolar, bipolar modes.	*11*	*K2*	*CO2*
		OR			
	b)	Illustrate how the electrical hazards protection can be provided in the biomedical instrumentation systems.	*11*	*K2*	*CO2*
25.	a)	What are the methods for measuring blood pressure? Sketch a typical setup and explain.	*11*	*K2*	*CO3*
		OR			
	b)	Construct a spirometer with the help of functional diagram and its working principle with neat sketch.	*11*	*K2*	*CO3*
26.	a)	With neat block diagram explain the principle of operation and working of MRI system.	*11*	*K2*	*CO4*
		OR			
	b)	Discuss how the various physiological parameters can be monitored and telemetered and usage of telemetry as an emergency tool.	*11*	*K2*	*CO4*
27.	a)	Analyze the circuit diagram of a microwave diathermy machine and its uses in detail.	*11*	*K2*	*CO5*
		OR			
	b)	Explain the working of lithotripsy with clear schematic diagrams.	*11*	*K2*	*CO5*
28.	a)	Examine the physiological origin and acoustic features of different heart sounds.	*11*	*K2*	*CO3*
		OR			
	b)	Explain the block diagram of a blood gas analyzer and describe how each part works in measuring blood gases.	*11*	*K2*	*CO3*