Reg. No.																

Question Paper Code	14111

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

Sixth Semester

Instrumentation and Control Engineering

20ICPC602 - BIOMEDICAL 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 "lub-dub" sound of the heart is caused by: (a) Valve opening (b) Valve closing (c) Muscle contraction (d) Blood turbulence	1	K1	CO1
2.	Which hormone regulates water reabsorption? (a) Insulin (b) ADH (c) Thyroxine (d) Cortisol	1	K1	CO1
3.	Which instrument is used for non-invasive blood pressure measurement? (a) ECG (b) Sphygmomanometer (c) Plethysmograph (d) Aneroid barometer	1	K1	CO2
4.	Which electrode is used to measure blood pO_2? (a) Severinghaus electrode (b) Clark electrode (c) pH electrode (d) Doppler sensor	1	K1	CO2
5.	Needle electrodes are primarily used for recording (a) ECG (b) EMG (c) ERG (d) EEG	1	K1	CO3
6.	Leakage current is the current that flows (a) Through a resistor (b) Through an ideal conductor (c) Through unintended paths in equipment (d) Through an external battery	1	K1	CO3
7.	Which technique is best suited for real time soft tissue imaging? (a) Ultrasound (b) X ray (c) MRI (d) Thermography	1	K1	CO4
8.	Retinal imaging commonly uses which technique? (a) A mode ultrasonography (b) Fundus photography (c) MRI scanning (d) Endoscopy	1	K1	CO4
9.	The imaging technique commonly used in fingerprint recognition is (a) Thermal imaging (b) Optical imaging (c) MRI (d) CT scan	1	K1	CO5
10.	Which of the following biometric techniques uses infrared imaging? (a) Voice recognition (b) Fingerprint recognition (c) Face recognition (d) Iris recognition	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define All or nothing law.	2	K1	CO1
12.	Interpret the trade-off between resolution and penetration with changing ultrasound frequency.	2	K2	CO1
13.	Why does indirect BP measurement show errors in patients with arterial stiffness?	2	K1	CO2
14.	How do optical path changes affect accuracy in a fingertip pulse oximeter?	2	K1	CO2
15.	Compare micro electrode and needle electrode.	2	K2	CO3
16.	Explain microshock and macroshock.	2	K2	CO3
17.	Compare Computer Tomography and Magnetic Resonance Tomography.	2	K2	CO4
18.	Outline the effect of magnetic field non-uniformity on MRI image quality.	2	K2	CO4
19.	Relate different types of Biotelemetry systems.	2	K2	CO5
20.	State the significance of audiometric results in identifying nerve-related hearing loss.	2	K1	CO5
21.	Mention the effect of focusing shock waves on the efficiency of lithotripsy.	2	K1	Co5
22.	What will happen if ribosomes stop functioning in a cell and relate the answer to cellular growth and repair?	2	K1	Co1

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Illustrate the basic components of a biomedical system with suitable diagrams.	*11*	*K2*	*CO1*
		OR			
	b)	Explain Biomechanics of bone with neat diagram.	*11*	*K2*	*CO1*
24.	a)	Outline the working of blood gas analyzers and explain measurement of pH, pCO_2, and pO_2 using different electrodes.	*11*	*K2*	*CO2*
		OR			
	b)	Explain body plethysmography with neat diagrams and discuss how lung volumes are derived.	*11*	*K2*	*CO2*
25.	a)	Interpret the working principle of microelectrodes and their significance in neural recordings.	*11*	*K2*	*CO3*
		OR			
	b)	Outline the placement of ECG Electrodes.	*11*	*K2*	*CO3*
26.	a)	Illustrate how ultrasonic waves are generated, transmitted, and reflected inside the body and explain how echo patterns are converted into images while noting the role of acoustic impedance in determining image clarity.	*11*	*K2*	*CO4*
		OR			
	b)	Explain how physiological signals are sensed, encoded, and transmitted wirelessly in biotelemetry systems and describe how channel selection and modulation maintain signal quality over long distances.	*11*	*K2*	*CO4*
27.	a)	Classify the different types of defibrillators and explain any two with neat diagram.	*11*	*K2*	*CO5*
		OR			
	b)	Interpret the different types of dialyzers with neat sketch.	*11*	*K2*	*CO5*
28.	a)	Examine the challenges involved in designing implantable pacemakers that balance miniaturization, reliability, and longevity.	*11*	*K2*	*CO5*
		OR			
	b)	Explain about different types of Robotic Surgery.	*11*	*K2*	*CO5*