Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 120013

B.E./ B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025
Third Semester
Biomedical Engineering
U23BM302 – BIOSENSORS AND MEASUREMENT DEVICES
(Regulation 2023)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Indicate the factors which decide the choice of a particular transducer for medical applications.	2	K2	CO1
2.	Draw and neatly label the block diagram of generalized instrumentation system.	2	K1	CO1
3.	Differentiate resistive, capacitive and inductive transducers in terms of working principle and application.	2	K2	CO2
4.	What is a thermistor and what are its advantages over other types of temperature transducers?	2	K2	CO2
5.	Describe the principle of a biosensor with the help of a neatly labeled diagram.	2	K2	CO3
6.	Explain how biochips are used in medical diagnostics.	2	K2	CO3
7.	Discuss the role of Surface Plasmon Resonance (SPR) technology in point-of-care diagnostics.	2	K2	CO4
8.	Compare the use of Surface acoustic wave devices with quartz crystal microbalance in mass sensing.	2	K2	CO4
9.	Mention the functions performed by signal conditioner before the signal is given to a display or recording device.	2	K2	CO5
10.	How does Kelvin bridge differ from Wheatstone bridge?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the sources and effects of instrumental errors in measurements and give examples.	13	K1	CO1
		(OR)			
	b)	Explain in detail the static characteristics of transducers.	13	K1	CO1
12.	a)	Accurate monitoring of joint angle is crucial for evaluating a patient's gait and prosthesis performance. Traditional resistive sensors used for angle or displacement measurements often suffer from wear, limited resolution, or poor bio-compatibility in long-term trials. Explain how LVDT can help to overcome the above issue.	13	K3	CO2
		(OR)			
	b)	Define a photoelectric transducer. What are the types of photoelectric cells? Illustrate the principle of photovoltaic cell with the help of a diagram.	13	K2	CO2
13.	a)	Discuss the immobilization techniques suitable for biosensors.	13	K3	CO3
		(OR)			
	b)	Explain with an example the role of biorecognition elements in point-of-care diagnostic biosensors.	13	K3	CO3
14.	a)	Early detection of cardiac biomarkers such as troponin is crucial for timely diagnosis and treatment of myocardial infarction. Conventional immunoassays like ELISA are sensitive but time-consuming and require bulky instruments. Suggest a biosensor which provides a promising alternative.	13	K4	CO4
		(OR)			
	b)	What is the role of glucose oxidase in a sensor? Describe with the help of a diagram the construction of a blood glucose biosensor.	13	K4	CO4
15.	a)	With a neat circuit diagram explain the working principle of differential amplifier and discuss its potential applications in recording bioelectric signals.	13	K3	CO5
		(OR)			
	b)	Compare CRO, CRT, and DSO in terms of functionality, accuracy, and application.	13	K4	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	In nuclear medicine, radioactive isotopes are used for diagnostic imaging and treatment. While these isotopes provide significant clinical benefits, they also pose radiation exposure risks to healthcare staff, patients, and the environment. Suggest a suitable counter and explain in detail that serves as a real-time device to monitor ionizing radiation levels in rooms, on surfaces, or even on personnel.	15	K3	CO2
		(OR)			
	b)	In ICU's, accurate assessment of a patient's metabolic rate is essential for nutritional planning and clinical decision making. Conventional methods like indirect calorimetry using metabolic carts are complex, expensive, and difficult to maintain continuously. Suggest and explain in detail a suitable sensor which could be a promising solution.	15	K4	CO4