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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

B.Tech-VIII Semester (Open Elective)

COURSE CODE (CREDITS): 21B1WPH831(03)

MAX MARKS: 60

COURSE NAME: Biosensors

COURSE INSTRUCTOR: Dr. Ragini Raj Singh

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

(c) Use of calculator is allowed.

Q.No	Question	CO	Marks
Q1	(a) Explain the importance of statistical analysis in biosensor measurements. Discuss arithmetic mean, standard deviation, variance, and histogram analysis in evaluating sensor performance.	2	4
	(b) Differentiate between primary calibration and secondary calibration methods. Explain the importance of calibration in biomedical instrumentation.		2
Q2	(a) Explain the principle and working of amperometric biosensors. Discuss the importance of working, reference, and auxiliary electrodes in amperometric transduction.	2	4
	(b) Describe the role of mediators, membranes, and metallized electrodes in improving the performance of amperometric biosensors.		2
Q3	(a) Discuss the working principle of potentiometric biosensors based on the Nernst equation. Explain the significance of ion-selective electrodes in biosensing applications.	3	4
	(b) Differentiate between potentiometric and conductometric biosensors with suitable biomedical applications.		2
Q4	(a) Describe the construction and working mechanism of an Ion Sensitive Field Effect Transistor (ISFET). Explain how ion concentration affects drain current.	3	4
	(b) Discuss the working of enzyme electrodes for glucose and urea estimation. Mention their biomedical significance.		2
Q5	(a) Explain the principle of optical biosensors based on Lambert-Beer law. Discuss fluorescence, absorbance, and refractive index based optical detection methods.	3	4
	(b) Describe the construction and working of a fiber optic pH sensor.		

	Mention two advantages of fiber optic biosensors in biomedical applications.		2
Q6	(a) Discuss the principle, construction, and biomedical applications of Surface Plasmon Resonance (SPR) biosensors. Why is SPR considered highly sensitive? (b) Explain the principle of calorimetric biosensors and discuss the role of thermistors in thermal transduction.	4	4
Q7	(a) Describe the structure and working mechanism of Pacinian corpuscles. Explain the process of receptor potential generation and adaptation. (b) Differentiate between hot receptors and cold receptors with respect to structure, temperature sensitivity, and physiological role.	4	2
Q8	(a) Explain the role of peripheral and central chemoreceptors in maintaining respiratory homeostasis. Discuss their response to changes in pO_2 , pCO_2 , and pH. (b) Describe the mechanism of baroreceptor reflex in regulation of arterial blood pressure.	4	4
Q9	(a) Describe the working principle of an electronic nose. Discuss the role of sample delivery system, sensor arrays, and computing systems in odor analysis. (b) Explain the construction and working of dynamic moving coil microphones and electret microphones used as sound transducers.	5	4
Q10	(a) Discuss the principle and working of phonocardiographs. Explain the significance of heart sound analysis in biomedical diagnostics. (b) Compare CCD and CMOS image sensors used in biomedical imaging systems.	5	4
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