

Master of Biomedical Engineering Examination, 2025

(1st Year, 2nd Semester)

Biosensors and Devices

Time: Three hours

Full Marks: 100

Answer any five questions

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| Q-1) (a) | Describe PO ₂ electrode and explain its principle of operation. Include necessary sketches in your answer. | 12 Marks |
| [CO2] | | |
| Q-1) (b) | Draw the circuit diagram of a temperature controller used for biosensing applications. Explain its operation. | 8 Marks |
| [CO2] | | |
| Q-2) | Discuss briefly with examples about the various methods of enzyme immobilization to make a biosensor. Include necessary sketches in your answer | 20 Marks |
| [CO1] | | |
| Q-3) (a) | Describe and explain with neat sketches how absorption type optical filters differ from interference filters. | 10 Marks |
| [CO3] | | |
| Q-3) (b) | Explain with neat sketch the method of LASER Doppler Velocimetry for biosensing | 10 Marks |
| [CO5] | | |
| Q-4) (a) | Describe with neat sketch Immunologically Sensitive Field Effect Transistor and explain its operation with an example | 12 Marks |
| [CO4] | | |
| Q-4) (b) | Explain the operation of variable inductance transducer for position measurement | 8 Marks |
| [CO4] | | |
| Q-5) (a) | Describe and explain Bioluminescence with an example for biosensing applications | 15 Marks |
| [CO5] | | |
| Q-5) (b) | Explain the significance of metal electrolyte interface | 5 Marks |
| [CO1] | | |
| Q-6) (a) | Describe with neat sketch Coulter Counter and explain its operation. | 12 Marks |
| [CO3] | | |
| Q-6) (b) | Two concentric metallic cylinders of length 0.15 m is separated by a radial distance of 0.02 mm. Inner cylinder has a diameter of 3 mm. what is the maximum capacitance of the transducer? If the inner cylinder is moved axially through a distance of 1.3 mm, calculate the change in capacitance | 8 Marks |
| [CO4] | | |

[Turn over

- Q-7) (a) Describe and explain with neat sketch how does a flame photometer work? 12 Marks
[CO3]
- Q-7) (b) Mention two application areas of flame photometry 2 Marks
[CO3]
- Q-7) (c) Explain with an example the principle of operation of animal tissue-based biosensor 6 Marks
[CO4]
- Q-8) (a) Derive the relationship between output voltage and input displacement when the resistance of the output measuring device connected to the potentiometer is 14 Marks
[CO4]
(i) appreciably large
(ii) and when it is not appreciably large
- Q-8) (b) Explain with neat sketch the method of Cyclic Voltammetry with an example 6 Marks
[CO5]