



B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Sixth Semester

MECHATRONICS ENGINEERING

U18MCE0018: Medical Mechatronics

COURSE OUTCOMES

CO1: Explain different measurement techniques used in physiological parameters measurement.

CO2: Describe the different sensors and transducer principles used in bio-medical applications.

CO3: Describe the signal conditioning circuits used in biomedical engineering.

CO4: Comment on various measurement systems used in diagnostics.

CO5: Comment on various monitoring systems used in diagnostics

CO6: Differentiate the working of recorders and explain the advanced systems used in medicine.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

- | | | |
|---|-----|-------------------|
| 1. Why are silver-silver chloride electrodes preferred for bioelectric signal recordings? | CO1 | [K ₂] |
| 2. Write down the significance of input impedance in determining the performance of a medical instrument? | CO1 | [K ₂] |
| 3. Define Gauge factor and its significance in blood pressure measurement. | CO2 | [K ₁] |
| 4. List out the types of displacement transducers used in medical applications. | CO2 | [K ₂] |
| 5. Mention the importance of chopper amplifier in biomedical instrumentation. | CO3 | [K ₂] |
| 6. Write a short note on Biosignal analysis. | CO3 | [K ₂] |
| 7. Name the various methods for measurement of blood flow. | CO4 | [K ₁] |
| 8. Define the term "Total lung capacity". | CO5 | [K ₁] |
| 9. Distinguish between pure tone audiometer and speech audiometer. | CO6 | [K ₂] |
| 10. List out the advantages of electron microscope over optical microscope. | CO6 | [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

- | | | | | | |
|-----|----|--|----|-----|-------------------|
| 11. | a) | Illustrate in brief the working of the respiratory system. Explain the mechanism of the oxygenation of the blood. | 8 | CO1 | [K ₂] |
| | b) | Draw the diagram for the electrode-electrolyte and skin interface for surface electrodes. Explain the potential developed across metal-electrolyte and electrolyte skin interface. | 8 | CO1 | [K ₂] |
| 12. | a) | Describe the construction and working of a blood glucose bio sensor with a neat sketch. | 8 | CO2 | [K ₂] |
| | b) | Illustrate the principle of optical fibre based temperature sensor. What are the advantages of optical fibre sensors over other types of sensors? | 8 | CO2 | [K ₂] |
| 13. | a) | Design a simple medical preamplifier circuit and explain the working of the circuit. | 8 | CO3 | [K ₂] |
| | b) | Explain the working of nonmechanical chopper amplifier with a neat sketch. | 8 | CO3 | [K ₂] |
| 14. | a) | Describe the working of an electromagnetic flowmeter with the help of a block diagram. | 8 | CO4 | [K ₂] |
| | b) | Explain the block diagram of the processing and computing circuit of thermal dilution method for cardiac output. | 8 | CO4 | [K ₂] |
| 15. | | Discuss the working of heart lung machine in detail with a neat sketch. | 16 | CO5 | [K ₂] |
| 16. | a) | Explain the working of short wave diathermy unit with a neat sketch. | 8 | CO6 | [K ₂] |
| | b) | Explain with the help of a diagram the working of a single channel ECG telemetry system. | 8 | CO6 | [K ₂] |
