

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

Sixth Semester

Electronics and Communication Engineering

20ECEL610 - MEDICAL ELECTRONICS

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

Marks *K-
Level* CO

- | | | | |
|--|---|----|-----|
| 1. Which of the following is considered to be the primary pacemaker of the heart?
(a) Sino-atrial node (b) Atrio-ventricular node
(c) Purkinje fibres (d) Bundle of His | 1 | K1 | CO1 |
| 2. The main design feature of pregelled disposable electrodes which helps to reduce the possibility of artefacts, drift and baseline wandering is _____.
(a) Low absorbency buffer layer with isotonic electrolyte
(b) High absorbency buffer layer with isotonic electrolyte
(c) High absorbency buffer layer without isotonic electrolyte
(d) Low absorbency buffer layer without isotonic electrolyte | 1 | K1 | CO1 |
| 3. Electrodes to measure EEG are placed on
(a) Forehead (b) Scalp (c) Cheek (d) Ears | 1 | K1 | CO2 |
| 4. The material used in limb surface electrode is
(a) German silver (b) Copper (c) Gold (d) Platinum | 1 | K1 | CO2 |
| 5. pH meters can be considered as voltage source with which of the following internal resistances?
(a) Very Low Resistance (b) Moderate Resistance
(c) Very High Resistance (d) No resistance | 1 | K1 | CO3 |
| 6. Which of the following controls the normal breathing process?
(a) Amino acids (b) Cholesterol
(c) Ventral Respiratory Group (d) Dorsal respiratory group | 1 | K1 | CO3 |
| 7. The membrane used for dialysis is made of
(a) cellulose (b) polyvinyl chloride (c) polyethylene (d) chitin | 1 | K1 | CO4 |
| 8. The commonly used MRI's have a magnetic strength of ____.
(a) 1.5 – 3 Tesla (b) 3 – 6 Tesla (c) 6 – 12 Tesla (d) 12 – 24 Tesla | 1 | K1 | CO4 |
| 9. Which diathermy machine is good for deep tissue healing?
(a) short wave (b) ultrasound (c) cold compress (d) electrical impulse | 1 | K1 | CO5 |
| 10. Lab-on-a-chip contributes to _____
(a) Increasing turnaround time (b) Miniature biochemical analysis
(c) Image processing (d) Bone density monitoring | 1 | K1 | CO6 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

- | | | | |
|--|---|----|-----|
| 11. Differentiate micropipette and metal microelectrode. | 2 | K2 | CO1 |
| 12. Examine the term phonocardiogram. | 2 | K2 | CO1 |
| 13. Mention the important bands of frequencies in EEG and their importance. | 2 | K1 | CO2 |
| 14. Explain how the contraction of skeletal muscle is identified. Give its specifications. | 2 | K2 | CO2 |
| 15. Write the principle of operation of colorimeter. | 2 | K1 | CO3 |
| 16. Define cardiac output measurement. Give the reason for decreasing the cardiac output. | 2 | K2 | CO3 |
| 17. List the various types of ventilators. | 2 | K1 | CO4 |
| 18. Explain the use of gradient coils in MRI scanners. | 2 | K2 | CO4 |

- | | | | |
|--|---|----|-----|
| 19. Compare shortwave, microwave and ultrasound diathermy. | 2 | K2 | CO5 |
| 20. List the applications of Biotelemetry. | 2 | K1 | CO5 |
| 21. Explain the use of lasers in medical applications. | 2 | K2 | CO6 |
| 22. List the cryogenic applications in medicine. | 2 | K1 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

- | | | | | |
|--------|---|----|----|-----|
| 23. a) | A 25-year-old athlete undergoes an electro-diagnostic test to evaluate muscle and nerve function. The medical team records various bio-signals during rest and activity. Describe the origin of biopotentials and how they are generated at the cellular level. | 11 | K2 | CO1 |
|--------|---|----|----|-----|

OR

- | | | | | |
|----|--|----|----|-----|
| b) | Explain the role of a differential amplifier in biomedical signal amplification. Describe its working principle and why it is essential for reducing noise in biopotential recordings. | 11 | K2 | CO1 |
|----|--|----|----|-----|

- | | | | | |
|--------|---|----|----|-----|
| 24. a) | A patient arrives at the emergency department with chest pain and dizziness. The doctor orders an Electrocardiogram (ECG) to assess the patient's heart condition. As a biomedical engineer identify proper ECG lead systems and recording methods for accurate diagnosis. Summarize the typical waveforms and signal characteristics observed in ECG recordings and discuss how they help in identifying potential cardiac abnormalities such as arrhythmias or myocardial infarction. | 11 | K3 | CO2 |
|--------|---|----|----|-----|

OR

- | | | | | |
|----|--|----|----|-----|
| b) | A 55-year-old patient presents with shortness of breath and suspected heart valve abnormalities. The cardiologist decides to use Phonocardiography (PCG) for further evaluation. Make use of appropriate lead placement and recording methods for capturing heart sounds. Interpret the typical waveforms and signal characteristics in PCG recordings and explain how they help in distinguishing normal and abnormal heart sounds, such as murmurs or valve defects. | 11 | K3 | CO2 |
|----|--|----|----|-----|

- | | | | | |
|--------|--|----|----|-----|
| 25. a) | Explain the Direct and indirect methods of Blood pressure measurement. | 11 | K2 | CO3 |
|--------|--|----|----|-----|

OR

- | | | | | |
|----|---|----|----|-----|
| b) | Summarize the working principle of conductive method blood cell counter and its construction details. | 11 | K2 | CO3 |
|----|---|----|----|-----|

- | | | | | |
|--------|---|----|----|-----|
| 26. a) | What is the need for a Pacemaker? With a neat diagram, discuss the different types of Pacemakers. | 11 | K2 | CO4 |
|--------|---|----|----|-----|

OR

- | | | | | |
|----|---|----|----|-----|
| b) | Explain the basic principle of ultrasonic imaging and describe how it is used in medical diagnostics. | 11 | K2 | CO4 |
|----|---|----|----|-----|

- | | | | | |
|--------|--|----|----|-----|
| 27. a) | What is Diathermy? Explain the principle of operation of Surgical Diathermy. | 11 | K2 | CO5 |
|--------|--|----|----|-----|

OR

- | | | | | |
|----|---|----|----|-----|
| b) | Explain the basic principles and workings of multichannel wireless telemetry systems. | 11 | K2 | CO5 |
|----|---|----|----|-----|

- | | | | | |
|--------|--|----|----|-----|
| 28. a) | Define Telemedicine. Draw the basic system Architecture of Telemedicine system. Explain in detail the various components of the Telemedicine system. | 11 | K2 | CO6 |
|--------|--|----|----|-----|

OR

- | | | | | |
|----|--|----|----|-----|
| b) | Explain the concept of a radio pill, describing its components, functions, applications, advantages, and limitations in medical diagnostics. | 11 | K2 | CO6 |
|----|--|----|----|-----|