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**Question Paper Code : 80505**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth Semester

Electronics and Communication Engineering

EC 8073 — MEDICAL ELECTRONICS

(Common to: Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any four common types of bio-medical signals measured in clinical settings.
2. How can the presence of artifacts (noise) in a bio-medical signal affect its interpretation?
3. Mention the two parameters commonly measured in respiratory assessment.
4. Recall the concepts of pH, PO<sub>2</sub>, and PCO<sub>2</sub> in physiological measurements.
5. Mention the significance of a cardiac pacemaker.
6. Outline the primary function of ultrasonic imaging systems.
7. What is the primary function of biotelemetry?
8. Define surgical diathermy.
9. What is the primary function of an insulin pump?
10. Interpret the primary purpose of a brain-machine interface.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the characteristics of a typical ECG waveform and explain the significance of each deflection. (6)
- (ii) Compare and contrast the typical waveforms and signal characteristics of EEG, EMG, and PCG signals, detailing their physiological origins and clinical significance. (7)

Or

- (b) (i) Describe various types of biopotential electrodes used for measuring physiological signals, including their design, materials, and placement considerations. (6)
- (ii) Evaluate the suitability of different bio-medical signal acquisition systems monitoring a patient in an intensive care unit. (7)
12. (a) (i) Discuss the methods and instruments used for measuring respiratory parameters such as tidal volume, minute ventilation, and lung capacity. (7)
- (ii) Explain the principles of blood pressure measurement including the use of sphygmomanometers and automated blood pressure monitors. (6)

Or

- (b) (i) Explain the concept of cardiac output, including its calculation and factors affecting it. (6)
- (ii) Discuss the clinical importance of cardiac output measurements in assessing cardiac function and diagnosing cardiovascular diseases. (7)
13. (a) (i) Explain the mechanism of action and different types of cardiac pacemakers used in medical practice. (7)
- (ii) Describe the operation and applications of DC defibrillators in cardiac resuscitation. (6)

Or

- (b) (i) Explain the process of hemodialysis and the role of dialysers in removing waste products and excess fluid from the blood. (7)
- (ii) Discuss the principles of mechanical ventilation and the different modes of ventilation delivered by ventilators. (6)

14. (a) (i) Explain the principle of surgical diathermy and its role in surgical procedures. (7)

(ii) Describe the types of surgical diathermy devices and their applications in different surgical specialties. (6)

Or

(b) Compare and contrast shortwave, ultrasonic, and microwave diathermy technique including their principles of operation, applications and advantages/disadvantages.

15. (a) Explain how radio pills work to transmit data from within the body to external receivers with illustration.

Or

(b) Explain how endomicroscopy techniques, such as confocal laser endomicroscopy (CLE) and optical coherence tomography (OCT), provide high-resolution imaging of tissues at the cellular level.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Describe the principles of Magnetic Resonance Imaging (MRI) and the components of MRI systems. Discuss the advantages and limitations of MRI compared to other imaging modalities. (8)

(ii) Explain the clinical application of MRI in diagnosing various medical conditions and monitoring disease progression. (7)

Or

(b) (i) Describe the various modalities of telemedicine, such as remote consultations, telemonitoring, and tele-education. (8)

(ii) Explain how lab-on-a-chip devices miniaturize and integrate multiple laboratory function onto a single microchip. (7)