



**B.E DEGREE EXAMINATIONS: MAY 2017**

(Regulation 2014)

Sixth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U14EETE13: Biomedical Instrumentation

**COURSE OUTCOMES**

**CO1:** Describe the physiology and anatomy of human system

**CO2:** Recognize the technical concepts and operation of the medical instrumentation.

**CO3:** Discuss the internal circuitry of medical instruments and its maintenance.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Matching type item with multiple choice code

CO2 [K<sub>1</sub>]

List I	List II
A. ECG	i. Diagnostic tool for brain alignment
B. EEG	ii. Diagnostic tool for heart alignment
C. EMG	iii. Test used to detect abnormal function of the retina
D. ERG	iv. Measures muscle response

- |    | A   | B  | C   | D   |
|----|-----|----|-----|-----|
| a) | ii  | i  | iv  | iii |
| b) | iii | iv | ii  | i   |
| c) | ii  | iv | iii | i   |
| d) | iii | i  | ii  | iv  |

2. The action potential is measured in millivolts (mV) and is ranged from:

CO1 [K<sub>1</sub>]

- |                   |                   |
|-------------------|-------------------|
| a) -90mV to +20mV | b) -70mV to +30mV |
| c) -65mV to +40mV | d) -30mV to +60mV |

3. Which of the following are piezo electric substances?

CO2 [K<sub>1</sub>]

1. Barium Titanate      2. Lead Titanate      3. Lead Zirconate      4. Cadmium and Sulphate

Choose the correct one

- |              |              |
|--------------|--------------|
| a) 1,2 and 4 | b) 1,3 and 4 |
| c) 1,2 and 3 | d) 2,3 and 4 |

4. The frequency range of ECG wave is CO2 [K<sub>1</sub>]  
 a) 0.05 — 100 Hz b) 0.5 — 160 Hz  
 c) 0.05 — 160 Hz d) 10 — 100 Hz.
5. **Assertion (A):** Transducer is a device which converts physical quantity into electrical quantity CO1 [K<sub>2</sub>]  
**Reason (R):** Transducer is also called as sensor.  
 a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A  
 c) A is true but R is false d) A is false but R is true
6. The pulse repetition rate of pacemaker is CO3 [K<sub>2</sub>]  
 a) 50 pulses/min b) 60 pulses/min  
 c) 70 pulses/min d) 80 pulses/min
7. Consider the following: 1. Pressure 2. Transduction element 3. Sensing element 4. Electrical signal CO1 [K<sub>2</sub>]  
 Correctly arrange the operation of transducer  
 a) 2-3-4-1 b) 1-3-2-4  
 c) 3-4-2-1 d) 4-1-3-2
8. Plethysmography is a process to measure CO2 [K<sub>2</sub>]  
 a) all body activity b) neural activity  
 c) respiratory output d) cardiac output
9. **Assertion (A):** Isolation amplifier provides electrical isolation and electrical safety barrier. CO2 [K<sub>3</sub>]  
**Reason (R):** The data acquisition components are protected from common mode voltages.  
 a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A  
 c) A is true but R is false d) A is false but R is true
10. Central patient monitoring stations usually monitor up to ..... patient(s). CO3 [K<sub>2</sub>]  
 a) one b) four  
 c) eight d) thirty

**PART B (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

11. Differentiate action potential and resting potential. CO1 [K<sub>2</sub>]
12. Define neuron and nerve fiber. CO1 [K<sub>1</sub>]

- |  |     |                   |
|--|-----|-------------------|
| 13. Name the electrodes used for EEG measurement.                                      | CO2 | [K <sub>1</sub> ] |
| 14. Examine the need of instrument amplifier in medical equipment.                     | CO2 | [K <sub>4</sub> ] |
| 15. Define cardiac rate.   | CO2 | [K <sub>1</sub> ] |
| 16. List the normal values of PH, PCO <sub>2</sub> and PO <sub>2</sub> in human blood. | CO2 | [K <sub>1</sub> ] |
| 17. Distinguish between fluoroscopy and radiography techniques.                        | CO3 | [K <sub>4</sub> ] |
| 18. Name the variables to be monitored by a patient monitoring system.                 | CO3 | [K <sub>1</sub> ] |
| 19. Define pacemaker. List the different modes of operation of Cardiac pacemakers.     | CO3 | [K <sub>1</sub> ] |
| 20. Generalize the purpose of audio meters.  | CO3 | [K <sub>3</sub> ] |

**Answer any FIVE Questions:-**  
**PART C (5 x 14 = 70 Marks)**  
**(Answer not more than 300 words)**

**Q.No. 21 is Compulsory**

- |   |     |     |                   |
|---|-----|-----|-------------------|
| 21. i) Explain the structure of human cell and its constituents with the help of neat diagram.  | (7) | CO1 | [K <sub>2</sub> ] |
| ii) Discuss the different parts of central nervous system and their activity.   | (7) | CO1 | [K <sub>2</sub> ] |
| 22. i) Discuss the working of differential amplifier and mention their importance in biomedical instrumentation.  | (7) | CO2 | [K <sub>2</sub> ] |
| ii) Explain any one method of measuring blood pressure.   | (7) | CO2 | [K <sub>2</sub> ] |
| 23. i) Define cardiac output and discuss the technique to determine cardiac output.   | (7) | CO2 | [K <sub>2</sub> ] |
| ii) Explain the origin of different heart sounds.   | (7) | CO2 | [K <sub>2</sub> ] |
| 24. i) Explain the different elements involved in biotelemetry systems.   | (7) | CO3 | [K <sub>2</sub> ] |
| ii) Discuss the working of dialyzer in detail.  | (7) | CO3 | [K <sub>2</sub> ] |
| 25. i) Explain MRI with neat block diagram.   | (7) | CO3 | [K <sub>2</sub> ] |
| ii) State the need of defibrillator and describe the schematic of implantable defibrillator.  | (7) | CO3 | [K <sub>2</sub> ] |
| 26. i) Explain briefly on the working of X ray machine.   | (7) | CO3 | [K <sub>2</sub> ] |
| ii) List the requirements of a good physiological transducer and explain the operation of any two types of physiological transducers with relevant sketches | (7) | CO2 | [K <sub>2</sub> ] |
| 27. List the electrodes used in biomedical and explain the types of electrodes in detail with necessary diagrams.   |     | CO2 | [K <sub>1</sub> ] |

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