



B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester.

ELECTRONICS & INSTRUMENTATION ENGINEERING

U15EITE07 : Bio Medical Instrumentation

COURSE OUTCOMES

- CO1:** Understand the physiology of systems and the measurements of bioelectric potentials.
- CO2:** Choose the appropriate instrument required for measurement of any non-electrical, physiological parameter
- CO3:** Acquire knowledge in electro- physiological measurements.
- CO4:** Acquire knowledge in medical imaging and PMS.
- CO5:** Understand about assisting and therapeutic equipment's.
- CO6:** Analysis of bio signals

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A characteristic potential difference established by the electrode and its surrounding electrolyte depends on the K₂ CO1
 - A. Cation, Anion, Electron & Temperature. C. Cation, Anion & Electron.
 - B. Cation & Electron. D. Cation & Anion.

2. The Nerve Impulse or Action Potential K₂ CO1
 - A. It results from the movement of ions (charged particles) into and out a neuron through the plasma membrane.
 - B. It results from the movement of potassium ions into and out a neuron through the plasma membrane.
 - C. It results from the movement of sodium ions into and out a neuron through the plasma membrane.
 - D. None of the above.

3. Reason for Half Cell Potential: K₂ CO3
- A. Does not exist along electrically active biological cell membranes
 B. Charge Separation at Interface.
 C. Oxidation reactions only at the electrode-electrolyte interface.
 D. Reduction reactions only at the electrode-electrolyte interface
4. Large currents in **Stimulating Electrodes** can cause: K₂ CO5
- A. Cavitation. B. Cell damage
 C. Heating. D. Cavitation, Cell damage & Heating
5. The Soda Lime and one way valve arrangement in water sealed Spirometer is to: K₂ CO1
- A. Prevent building up of CO₂ during breathing. B. To allow the bed to Float.
 B. Prevent building up of NO₂ during breathing. D. Used as counter weight.
6. A beam of X-rays passing through the body is differentially absorbed and scattered by structures in the beam path depends on : K₂ CO4
- A. Physical density. B. Atomic composition of the structures.
 C. Energy of the X-ray beam. D. All the above.
7. Basic Characteristics of a Biosensor depends on: K₂ CO2
- A. High Linearity & Sensitivity. B. High Linearity & Low Sensitivity.
 C. High Linearity & Selectivity D. High Linearity, Sensitivity & Selectivity.
8. Endoscopy is the examination of: K₂ CO2
- A. Heart activity. B. Brain activity.
 C. Inspections of the interior of body organs. D. Muscle activity.
9. Microbolometer is a grid of: K₂ CO4
- A. Lead Oxide B. Carbon Dioxide.
 C. vanadium oxide. D. Oxides of Metal.
10. Match the Following
- | | | |
|------------------------------|---|--------------------|
| i) Thermography | a) Kidney Functioning. | |
| ii) Pacemaker | b) Knee inflammation | K ₂ CO6 |
| iii) Audio meters | c) Free running Oscillator | |
| iv) Dialyzer. | d) Information about Hearing capability | |
| A. i-a, ii-b, iii-c, iv-d. | B. i-c, ii-b, iii-d, iv-a | |
| B. C. i-b, ii-c, iii-d, iv-a | D. i-d, ii-c, iii-b, iv-a | |

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

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| 11. | Explain All-or-None Principle with respect to action potential. | K ₂ | CO1 |
| 12. | What are the characteristics of bio sensors? | K ₂ | CO2 |
| 13. | Where is the Origin of EEG waves? Classify their types. | K ₂ | CO6 |
| 14. | Name the two types of EMG electrodes and analyze the signal acquired and interpretation. | K ₃ | CO3 |
| 15. | How do you record Heart sound? Name them and their interpretation. | K ₂ | CO3 |
| 16. | What is the law that governs the respiratory activity? How the diaphragm activity is related to the Law? | K ₃ | CO5 |
| 17. | What are the IR imaging technique? | K ₂ | CO4 |
| 18. | What are the components in an endoscopy instrument? Also name the three main control body embedded within endoscopy. | K ₂ | CO5 |
| 19. | What is the instrumentation involved in delivering power to the Defibrillator unit? | K ₂ | CO5 |
| 20. | What is the open loop and closed loop instrumentation mean to in Ventilators operation? | K ₂ | CO4 |

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

Q.No. 21 is Compulsory

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|-----|--|------|----------------|-----|
| 21. | i. How are bio-potential electrodes classified? Explain one of its type with appropriate diagram. | (6) | K ₂ | CO1 |
| | ii. What are Stimulating Electrodes? Could you build an electrical equivalent circuit? Give reasons. | (5) | K ₂ | CO3 |
| | iii. Name few stimulating electrode types with applications. | (3) | K ₂ | CO1 |
| 22. | i. Brief on sensing the heart's electrical activity via electrodes. | (7) | | |
| | ii. Built an ECG monitoring circuit using Instrumentation Amplifier along with its supplementary circuits and explain the data processing operation. | (7) | K ₃ | CO6 |
| 23. | i. How do you classify X-Rays for biomedical applications? Which type is used and why? | (4) | | |
| | ii. Explain the principle of operation of X-Ray Machine with suitable diagram. | (10) | K ₃ | CO4 |

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| 24 | i. | Define Computed tomography (CT) and name the different equipments in CT | (7) | | |
| | ii. | Explain the operation principle of Electron beam Tomography with a suitable diagram. | (7) | K ₂ | CO4 |
| 25. | i. | Explain the principle of operation of a heat lung machine with suitable diagram. | (12) | | |
| | ii. | What are their limitations? | (2) | K3 | CO2 |
| 26. | i. | Classify and differentiate the types of dialyzers. | (4) | | |
| | ii. | Explain one principle technique used in the operation of a Dialyzers with a suitable diagram. | (10) | K3 | CO5 |
| 27 | i. | Reason out the need of biotelemetry systems in the current scenario. | (2) | | |
| | ii. | Explain the principle of operation of one type of biotelemetry systems and patient monitoring with a suitable diagram. | (12) | K3 | CO6 |
