M.TECH. INSTRUMENTATION AND ELECTRONICS ENGINEERING FIRST YEAR FIRST SEMESTR - 2024

MEDICAL INSTRUMENTATION

Time: Three hours | Full Marks: 100

Answer any ***four*** questions.

All questions carry ***equal*** marks.

1. Using basic laws and postulates deduce the Nernst equation, applicable for calculating the resting potential of a Membrane permeable to one ion. How this equation can be applied to the case of a membrane permeable to two ions?

2. Describe the steps of development of an electrical equivalent circuit model for a cell membrane. Deduce an expression for resting potential (V_m), when a current pulse of constant amplitude I_m is applied across the cell membrane.

3. Discuss briefly about the Biopotential Electrode and also develop its electrical equivalent circuits. With the help of a neat schematic diagram describe the principle of operation and applications of three types of Noninvasive Biopotential Electrodes.

4. With the help of a neat block diagram describe the principle of operation of an ECG Machine and hence also discuss all standard types of Lead connections. Draw a neat circuit diagram of a Wilson neutral point.

5. Draw a neat block diagram of a C-T Scanner Machine and discuss their principle of operations. Describe in detail how an image is reconstructed with the help of "Summation Method of Reconstruction" technique.

6. With the help of a neat block diagram describe the principle of operations of an X-ray machine in detail that is used for medical purpose.