B.E. INSTRUMENTATION AND ELECTRONICS ENGINEERING
THIRD YEAR
SECOND SEMESTER EXAM 2022
Subject: BIOMEDICAL INSTRUMENTATION

Full Marks: 100 **Tme: Three hours**

Different parts of the same question should be answered together.

CO1 Answer any **one** from **(a) and (b)** in this block [20]

[20] [1] (a) With the help of a characteristic curve explain the electrical activities of a Bio-cell and write down the name of the characteristic curve. Why studies of refractory priods are important? What do you mean by an artifact?
(b) What is a Biopotential? Name six types of Biopotential sources. How these Biopotentials are sensed or measured?

CO2 Answer any **one** from **(a) and (b)** in this block: [20]

[20] [2] (a) How all types of Biopotential electrodes are classified? Explain with the help of the equivalent circuits of a skin and Biopotential electrode interface, (i) for single electrode system and (ii) for two electrodes system. With the help of schematic diagram describe the construction and operations of a surface electrode and microelectrode.
(b) With the help of a neat block diagram describe the functions of Heart and Lung in the Cardio-Vascular circulatory system. What is an 'AV' and 'SA' node?

CO3 Answer any **two(2)** from **(a), (b)** and **(c)** in this block: [20+20]

[40] [3] (a) 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.
(b) Why artificial pacing is needed? State the various types of pacing modes and describe their principles briefly. With the help of a block diagram showing the components of the circuitry of an artificial pacemaker, discuss the principles of operation of each block.
(c) With the help of a neat block diagram describe the principle of operation of an ECG Machine and hence also discuss normal types of Lead connections. Discuss and draw a neat circuit diagram of Wilson's augmented unipolar limb leads and unipolar chest leads system.

CO4 *Answer any* **one(1) from (a) and (b)** *in this block:* [20]

[20] [4] (a) With the help of a block diagram describe the principle of a Transmitter and a Receiver used for bio-telemetering purpose. Explain how four physiological parameters can be monitored and telemetered simultaneously.
(b) With the help of a neat sketch discuss the principle of operation and a suitable application of the following sensors/tranducers.
i) Linear position and displacement sensor ii) LVDT used as a distance and displacement measurement iii) Thermocouple with cold junction compensation used as a temperature measurement iv) A primary pressure sensor
State which of them are active and passive sensor/transducer.
