Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, DECEMBER - 2019

SUBJECT: BIOMEDICAL INSTRUMENTATION [ICE 3102]

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A. Model the electrical equivalent of a bio-potential electrode which is in contact with its electrolyte

1B. Explain the bipolar limb lead configuration used in ECG recording

1C. Draw the block diagram of an EEG unit and explain the different parts in it.

(3+3+4)

2A Which type of pacemaker can be used when there is a conduction block (atria are able to depolarize on their own)? Explain with a suitable block diagram.

2B A Doppler blood flow velocity probe is set at an inclination of 45^{o} with the skin surface to measure the blood flow of an underneath blood vessel. The frequency of the ultrasonic wave being transmitted to the blood flowing in the vessel is 7MHz. The Doppler shift in the frequency of the received ultrasonic wave is observed to be 10kHz. Calculate the blood velocity. Assume the velocity of the sound in the flowing blood=1500m/s.

2C Differentiate between synchronous and asynchronous pacemaker.

2D Explain a type of synchronous pacemaker that is used when the conduction system of the heart is blocked.

(3+2+2+3)

3A What is the function of a membrane in the dialysis process? What are the different types of membranes used for dialysis?

3B What is the principle of working of 'Pulse Oximeter'? What type of transducer is used for pulse oximetry? Explain the signal processing arrangement in a pulse oximeter .

3C How lung volume and capacities can be determined experimentally? Explain.

(3+4+3)

4A What is 'M' mode display in an ultrasound system? Name the instrument used in medical practice based on M-mode display. Describe its working with the help of a block diagram.

4B Explain detector system of MRI machine with its block diagram.

4C With a block diagram, explain different components of X-ray machine.

(5+2+3)

5A What is Incubator? What are the factors considered in designing an incubator?

5B What is apnea monitor? Explain its working with block diagram.

5C Name any six endoscopes used in the medical field and mention their applications.

(3+3+4)

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