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53 (IE 801) BIIN

2016

## BIOMEDICAL INSTRUMENTATION

Paper : IE 801

Full Marks : 100

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

**Answer any five questions out of seven.**

1. (a) With a block diagram, explain biomedical instrumentation system. 8
- (b) Draw an action potential waveform. 4
- (c) How the human heart acts as a pump? 8
2. (a) Draw a differential amplifier using an operational amplifier. Derive its output voltage. 6

Contd.

- (b) Design an instrumentation amplifier for a gain ;  $G=1250$ , using three operational amplifier. 10
- (c) Explain surface electrodes. 4
3. (a) Define Cardiac Output. Calculate stroke volume for a patient having cardiac output and heart rate of 4 litres/minute and 80 beats per minute ; respectively. 4
- (b) Explain heart sounds. 6
- (c) Explain the need of a defibrillator. 4
- (d) Explain plethysmography. 6
4. (a) Explain the construction and working of a waterless spirometer. 8
- (b) A patient has undergone spirometric test and in the test, the technician has instructed patient to breath in the following sequence : rest for one respiratory cycle, forcefully inhale for one respiratory cycle, rest for one respiratory cycle and forcefully exhale for one respiratory cycle. Draw the patient spirogram and label the lung volumes and capacities. 7

- (c) A person has a total lung capacity of 5.95 litres. If the volume of air left in the lungs at the end of maximal expiration is 1.19 litres. What is his vital capacity ? 5
5. (a) Explain the construction and working of a heart-lung machine. 12
- (b) Explain a non-invasive technique for blood pressure measurement. 8
6. (a) Explain A-scan, B-scan and M-scan imaging technique in ultrasound. 12
- (b) Explain bipolar limb leads configurations in ECG measurement. 8
7. Write short notes on : 4×5=20
- (a) Synapse
- (b) Piezoelectric transducer
- (c) Microelectrodes
- (d) Resting potential.
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