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B. Tech

CPBM 8401

Seventh Semester Examination – 2008

BIOMEDICAL ELECTRONICS AND
INSTRUMENTATION

Full Marks – 70

Time – 3 Hours

*Answer Question No. 1 which is compulsory
and any **five** from the rest.*

*The figures in the right-hand margin
indicate marks.*

1. Answer the following questions : 2×10
- (a) Write the meaning of the following signals
EEG, EMG, ERG and EOG.
- (b) What is "Helmholtz Double Layer" in metal-
electrolyte interface ? Is it a desirable
property ?

P.T.O.

- (c) List the advantages of using Thermistores for measuring temperature as compared to thermocouples.
- (d) Explain the use of silicon diode as a temperature sensor.
- (e) What should be the maximum leakage current when measured from patient leads to ground or through the main instrument grounding wire ?
- (f) Write the nominal blood pressure values in the Arterial system and venous system.
- (g) Mention the problems that encountered when fine waves are used as a source of excitation in electromagnetic flowmeter.
- (h) Why reference electrodes are used in pH meter ?
- (i) List different types of cells and their average sizes present in blood.

- (j) List the effects of electric current on the human body along with the current ranges.
2. (a) What is half-cell potential ? Draw the equivalent circuit between a pair of electrodes, body tissue and fluids and mention the physiological parameters for which the circuit elements represent in the equivalent circuit. 5
- (b) Why microelectrodes are used ? With neat diagram explain the construction of types of microelectrodes. Mention the microelectrode that is not preferred for steady state potential measurement and give reason. 5
3. (a) Describe the construction and operation of a fibre optic based intracranial pressure transducer which measures the pressure by continuously balancing air pressure within a transducer against external pressure acting on a membrane. 5

- (b) With a suitable diagram explain different types of pulse sensors used for the measurement of cardiac pulse. 5
4. (a) Draw a simple block diagram of an ECG machine. Explain the types of artifacts commonly observed during ECG recordings. 5
- (b) Explain the origin of heart sound. Describe the types of microphones commonly in use for recording phonocardiograms. What are the desirable characteristics of the amplifiers and wiring methods for phonocardiography. 5
5. (a) Apnoeic patients require close and constant observation. What is Apnoea? Write the basic principle of operation of Apnoea detectors. Draw a block diagram of Apnoea Monitor and explain its operation. 5

- (b) Explain in brief, the following methods of measurement of Respiration Rate : 5
- (i) Thermister method
- (ii) Impedance Pneumography
- (iii) CO₂ method of respiration rate measurement.
6. (a) With a neat diagram, explain the principle of operation of a Laser doppler flow meter. What are the advantages and disadvantages in this method. 5
- (b) What is acid-base balance in blood and how it is controlled by physiological mechanism? 5
7. (a) Describe the construction and explain the principle of operation of Coulter counter. 5
- (b) Explain in brief the procedure of calculation of the following size of cells (any five) MCV, MCH, MCHC, MPV, PCT, RDW, and PDW. 5

8. Write notes on any *two*: 5×2

(a) Types of leakage current and testing of biomedical equipment.

(b) Direct and Indirect method of blood pressure measurement.

(c) Cardiometer.

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