Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(ECE)/SEP.SUPPLE/SEM-8/EC-804B/2012

2012

MEDICAL ELECTRONICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The value of action potential is

a) – 20 mV b) 20 mV

c) – 40 mV d) 40 mV.

ii) The value of resting potential ranging from

a) 0 to 50 mV b) 50 to 100 mV

c) – 50 to – 100 mV d) – 60 to – 100 mV.

iii) Natural pacemaker of the heart is

a) AV node b) SA node

c) Bundle of His d) Purkinje fibre.

iv) The pH of blood is

a) alkaline b) acidic

c) neutral d) all of these.

v) Phonocardiogram is a graphic recording of heart

a) sounds b) pressure

c) blood flow d) all of these.

vi) Biopotential signal generated from heart muscles along three-dimensional axis of the body is known as

a) VCG b) EEG

c) ECG d) EMG.

vii) Skin impedance is denoted by a parallel combination of

a) capacitor and resistor

b) capacitor and inductor

c) resistor and inductor

d) none of these.

viii) Human body temperature ranges from

a) 85° F to 95° F b) 50° F to 100° F

c) 40° F to 60° F d) 70° F to 120° F.

ix) The frequency band of alpha wave in an EEG pattern is in the range

a) from 3½ Hz to about 8 Hz

b) from about 8 Hz to about 13 Hz

c) above 13 Hz

d) below 3½ Hz.

x) Systolic blood pressure in the normal adult is in the range of

a) 50 mm Hg to 100 mm Hg

b) 95 mm Hg to 140 mm Hg

c) 60 mm Hg to 90 mm Hg

d) 100 mm Hg to 150 mm Hg.

xi) The indicator substance used in Fick's method for evaluation of cardiac output is

a) CO_2 b) O_2

c) radioactive tracer d) indicyanine green.

xii) The most lethal range for electrical shock is

a) 100 mA - 200 mA b) 50 mA - 100 mA

c) 200 mA - 300 mA d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Give a block diagram representing biomedical instrumentation system. Discuss the function of each block.
3. Explain the origin of bio-potential. Also explain the role of Na^+ and K^+ ions in developing this potential.
4. Explain the operation of the heart and the cardiovascular system briefly.
5. Briefly describe about the direct method of blood pressure measurement.
6. What are important volumes and capacities of lung ? What is spirometer ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What are polarization and depolarization in a biological cell ?

   b) Derive Nernst equation related to origin of bio-potential.

   c) Write about Biosensor. 4 + 7 + 4

8. a) Define half cell potential. Describe the feature that give rise to half cell potential.

   b) What do you mean by 'reference electrode' ? Name three basic types of electrodes for measurement of bio-electric potentials.

   c) Write about regulation and standard of medical devices.

5 + 6 + 4

9. a) How can blood oxygen be monitored using fibre-optic catheter ?

   b) Draw the normal ECG waveform. Explain the significance of alphabetic designations (*P, Q, R, S, T, U*).

   c) Explain different types of ECG lead configuration with diagram.

5 + 5 + 5

10. a) Discuss about the electrical hazards of medical instruments.

    b) What is the difference between electrical macroshock and microshock ?

    c) What is a 'pacemaker' ? Write short notes on pacemaker.

5 + 5 + 5

11. a) What is MRI ? Explain the terms 'precessional frequency', 'T1 recovery', 'T2 decay' and 'FID'. Briefly explain how discrimination can be done among biological tissues.

    b) What is ultrasonic imaging ? Explain the working of an ultrasonic imaging system.

    c) What do you mean by *A*-mode and *B*-mode scanning ?

(2 + 3 + 3) + (1 + 3) + 3

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