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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: EC365

Course Name: BIOMEDICAL ENGINEERING (EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Explain with necessary diagram how action potential is generated in human body and write the nernst equation for resting membrane potential. (7)

b) The intracellular k^+ concentration of a group of cells averages 140×10^{-6} moles/cm^3. The extracellular concentration of k^+ averages 4×10^{-6} moles/cm^3. Find: i) Concentration ratio ii) Diffusion potential for k^+ (3)

c) Explain the following: (3)

i) Half cell potential ii) Ag-AgCl electrode.

d) What are the essential features required for bio-potential amplifiers? (2)

2 a) With a neat sketch explain the working of human heart. (7)

b) Draw a typical ECG signal and mark its amplitude and time. (2)

c) Explain the principle, lead configuration and recording system of ECG. (6)

3 a) With the help of a diagram explain any one direct method for the measurement of blood pressure. (7)

b) Explain the basic principle of electromagnetic blood flow meter and with neat sketch explain Ultrasonic blood flow meter. (8)

PART B

Answer any two full questions, each carries 15 marks.

4 a) List the different waves in EEG recording and explain the 10-20 lead system used to record EEG. (4)

b) With neat sketch explain any two types of electrodes used in EEG recording (3)

c) Explain how nerve conduction velocity is calculated? An EMG signal has the following specifications. Maximum signal amplitude 3mV and bandwidth 20 to 3000 Hz. Draw the block diagram of EMG measurement and explain the need for each block. (8)

5 a) List any four human respiratory parameters and define each in two lines and explain how spirometer can be used for respiratory volume measurement. (8)

b) Explain any one method to measure blood cell count. (4)

c) What is Flame photometer? (3)

6 a) Explain what is a cardiac defibrillator? Describe the different types of cardiac pacemakers used in medical fields. (8)

b) With a block diagram explain the working of a hemo-dialysis machine. (7)

PART C

Answer any two full questions, each carries20 marks.

7 a) How X-rays are produced?What are its properties?Mention any three applications of X-rays in medicine. (8)

b) What is the basic principle of Computed Tomography (CT)?How image reconstruction is done in CT. (8)

c) Mention four major applications of CT. (4)

8 a) What is the principle of Ultrasonic imaging and describe the imaging modalities of Ultrasonic imaging system? (8)

b) Compare A-mode, B-mode and M-mode displays in Ultrasonic imaging system. (6)

c) Describe the image acquisition and reconstruction techniques in Magnetic Resonance Imaging (MRI). (6)

9 a) What are the basic components of telemetry system? Describe single channel telemetry system for ECG and temperature. (9)

b) Mention any three major applications of telemetry in medicine. (3)

c) What are the sources of electrical hazards? Explain about the precautions to be observed to prevent electric shock hazards. (8)

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