

Reg

No.: _____

Name: _____

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/cm³. The extracellular concentration of K^+ averages 4×10^{-6} moles/cm³. 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 carries 20 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)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC365

Course Name: BIOMEDICAL ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- | | | | |
|---|----|---|-----|
| 1 | a) | What is bio-electric potential? Explain with necessary illustration. | (6) |
| | b) | With necessary illustration, explain any two basic ECG lead configurations. | (9) |
| 2 | a) | Explain the construction of any two of them with necessary illustration: | (8) |
| | | i) Microelectrodes ii) Skin surface electrodes | |
| | | iii) Needle electrodes | |
| | b) | What is an isolation amplifier? What is its significance? Illustrate any one methods. | (7) |
| 3 | a) | Explain electro conduction system of the heart with illustration. | (8) |
| | b) | Explain the working of ultra sonic blood flow meter, with illustration. | (7) |

PART B

Answer any two full questions, each carries 15 marks

- | | | | |
|---|----|--|-----|
| 4 | a) | What is plethysmograph? Explain full body plethysmograph with illustration. | (7) |
| | b) | What is dialysis? Explain any one type of dialyzer with necessary illustration. | (8) |
| 5 | a) | With necessary illustration, explain the placement of electrodes for recording EEG signal. | (7) |
| | b) | Explain the following with illustration: | (8) |
| | | i) Flame photometer ii) Spectrophotometer | |
| 6 | a) | What is a pacemaker? What is its significance? Explain the working with illustration of an atrio-synchronous pacemaker. | (7) |
| | b) | What is diathermy? With a neat block schematic diagram, explain the working and applications of surgical diathermy equipments. | (8) |

PART C

Answer any two full questions, each carries 20 marks

- | | | | |
|---|----|--|-----|
| 7 | a) | Draw the block schematic of CT scan system and explain. | (7) |
| | b) | Explain NMR with necessary illustration. | (5) |
| | c) | Illustrate and explain the components of bio telemetry system, also write the application of telemetry in medicine. | (8) |
| 8 | a) | Explain the principle of image reconstruction in CT scan. | (5) |
| | b) | Explain with illustration the basic pulse echo system. | (6) |
| | c) | Compare and contrast, A-Scan, B-Scan and M-Scan, with illustration. | (9) |
| 9 | a) | Explain the sub-systems of NMR imaging system with necessary illustration. | (5) |
| | b) | Explain how electric shock is hazardous to human body. What changes it will bring in the body, when the current increases. | (7) |
| | c) | With the help of necessary sketches, explain single channel telemetry system for ECG and temperature monitoring. | (8) |

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EC365

Course Name: BIOMEDICAL ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) What is the need for a biomedical instrument? With a neat block diagram explain the significance of each basic component in it. (8)
- b) Compare direct and indirect blood pressure measurement. What is Korotkoff sound in blood pressure measurement? (7)
- 2 a) A patient was subjected to non-invasive method of blood pressure measurement. Which is the method used? What is the principle behind the method and how is it done? (10)
- b) With a neat diagram explain carrier amplifier. (5)
- 3 a) What is ECG? With a neat sketch explain the various segments of an ECG waveform. (8)
- b) How does depolarisation and repolarisation occur in a cell? (7)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) A person was found to have variation in the oxygen content in his blood. Which method would have helped him determine this? With a neat diagram explain any one type of this method. (8)
- b) Explain any one type of a dialyzer with a neat diagram. (7)
- 5 a) Define the term nerve conduction velocity. (2)
- b) Draw a figure showing how the electrodes are placed in a 10-20 system of placement of electrodes to perform the EEG analysis. (5)
- c) What is a cardiac defibrillator? With a neat diagram explain DC defibrillator. (8)
- 6 a) Explain with a neat diagram the respiratory system of a human body. (7)
- b) What is surgical diathermy? Explain the various electro surgery techniques available. (8)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) List any four properties of X-ray. With a neat block diagram explain the working of a X-ray machine. (10)
- b) What is the principle behind NMR imaging? What are the advantages of NMR imaging? (10)
- 8 a) Explain about image reconstruction in CT scan. (7)
- b) Compare CT scan and X-ray imaging technique. (4)
- c) With a neat block diagram explain single channel ECG telemetry transmitter. (9)
- 9 a) With a neat block diagram explain basic pulse echo system. (10)
- b) What are the requirements of a real time ultrasonic imaging system? (3)
- c) What are the precautions taken to minimize electric shock hazards? (7)
