Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

Online End Semester Examination , Dec 2021

Course: Biomedical Mechatronics — Semester:VII

Program:B.Tech Mechatronics — Time:03 Hrs

Course Code: MECH4010P — Max Marks: 100

Section A

1. Each Question will carry 4 Marks

Sl.N	Question	CO's
Q1	List the function of electrical activity of excitable cell in bioelectric potential.	CO1
Q2	Find the problem in electrophysiology.	CO1
Q3	Explain the functional organization of the peripheral nervous system.	CO2
Q4	Explain the resting rhythms of the brain.	CO2
Q5	Define the M wave and the H reflex.	CO2

Section B

1. Each Question will carry 10 Marks

Q1	A set of bio potential electrode made of silver is attached to the chest of a patient to detect the electrocardiogram. When the current passes through the anode, it cause silver to be oxidized, producing silver ions in solution. There is a 10μA leakage current between these electrodes. Determine the number of silver ions per second entering the solution at the electrode –electrolyte interface.	CO3
Q2	A electrocardiograph has a broad frequency response so that its amplifier has a first order time constant of 16s . The electrocardiograph amplifier has a broad dynamic range of input voltages, but any input voltage greater than ±2mV will be out of the ranges of its display and cut off. While recording the ECG of a patient, a transient occurs that has an amplitude of 10mV, and this causes the ECG to fall out of the range of the instrument's display. If the ECG R wave has an amplitude of 1mV, how long will it take for the entire signal to be visible on the display.	CO3
Q3	Discuss the factor that enter into choosing a resistance values for the three resistors used to establish the Wilson central terminal. Describe the advantages and disadvantages of having this resistance either very large or very small.	CO4

Q4	A heart murmur has a frequency of 300 Hz. Give the block diagram and sketch waveform for the special instrumentation that enables us to show the occurrence of this murmur on a 0 to 80 Hz pen recorder.	CO4
Section C 1. Each Question carries 20 Marks.		
Q1	Design a portable system for indirectly measuring blood pressure every 5 minutes on ambulatory subjects. It should operate without attention from the subject for the 24 Hrs. Show a block diagram and describe the system operation including power source, sensor, storage and algorithm.	CO3
Q2	The maximal average velocity of blood in a dog 1m/s occurs in the dog's aorta, which is 0.015m in diameter. The magnetic flux density in an electromagnetic blood flowmeter is 0.03T. Calculate the voltage at the electrodes. OR For cardiac catheterization , describe the characteristics of the dye used to improve visualization. Describe the characteristics of the dye used for measuring cardiac output.	CO4