


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: Bioelectronics Program: B.Tech. (Electronics and Communication) Course Code: ECEG4026P		Semester : 7th Time : 03 hrs. Max. Marks: 100	
Instructions:			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q1	Explain electrode-electrolyte interface with the help of equivalent electrical circuit.	4M	CO1
Q2	Draw the electrical equivalent circuit of a piezoelectric sensor.	4M	CO4
Q3	What is foetal electrocardiography? Draw its block diagram and explain all modules.	4M	CO2
Q4	Draw and explain active integrator and differentiator circuits.	4M	CO4
Q5	A piezoelectric sensor has $C = 500\text{nF}$. The sensor leakage resistance is $10\text{G}\Omega$. The amplifier input impedance is $5\text{M}\Omega$. What is the low-corner frequency?	4M	CO4
SECTION B (4Qx10M= 40 Marks)			
Q6	Define a typical lead II electrocardiogram and label all waves (P, QRS, T) and intervals. Explain what is happening electrically within the heart during each wave or interval.	10M	CO1
Q7	Explain in detail the problems frequently encountered during the electrocardiography with suitable examples.	10M	CO3
Q8	How do we measure pH? Explain the working of pH electrode.	10M	CO1
Q9	<p>A small rural hospital would like to purchase an electroencephalograph but cannot afford to build a shielded room in which to measure patients' EEGs. A clinical engineer has determined that there can be common-mode noise on their patients with amplitudes as large as 100mV. What must the minimum CMRR of their electroencephalograph be so that an EEG signal of 25 μV has no more than 1% common-mode noise?</p> <p style="text-align: center;">Or</p> <p>Explain the international 10-20 system for recording of electroencephalogram (EEG). Write the frequency and amplitude ranges of EEG signals.</p>	10M	CO2

SECTION-C
(2Qx20M=40 Marks)

Q 10	<p>i. Describe the functional block diagram of electrocardiograph (ECG) device. Explain all the modules of ECG device.</p> <p>ii. Explain the working of right-leg driven system.</p>	(10+10) M	CO2, CO3
Q 11	<p>i. Name the two basic causes of abnormal heart murmurs. For each type, give an example and show on a sketch when it occurs relative to systole and diastole.</p> <p>ii. Sketch the block diagram and waveform to show the elements required for an ultrasonic determination of blood pressure.</p> <p style="text-align: center;">OR</p> <p>i. Design a system for electrolytically forming Ag/AgCl electrodes. Give the chemical reactions that occur at both electrodes.</p> <p>ii. Explain international 10-20 system for electroencephalography (EEG). Describe event related synchronization/ Desynchronization (ERD/ERS) for motor imagery-based brain computer interface system.</p>	(10+10) M	CO3, CO4