

**B.E. ELECTRICAL ENGINEERING 4<sup>TH</sup> YEAR 2<sup>ND</sup> SEMESTER EXAMINATION, 2024****SUBJECT: - BIOMEDICAL INSTRUMENTATION**

Time: Three hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART- I	Marks
1.	<p>Answer any TWO. [CO4-K4]</p> <p>Mention clearly whether the following statements are true or false. Justify in favour of your comment.</p> <p>(a) "The captured waveform of Motor Unit Action Potential Train (MUAPT) contains repetitive pattern of identical wave segment MUAP."</p> <p>(b) "During acquisition of ECG voltage, the right leg potential and Wilson central terminal potential are kept same."</p> <p>(c) "The phase difference of all the precordial leads are same and exist in the horizontal plane."</p>	6x2=12
2.	<p>Answer any TWO. [CO3-K3]</p> <p>(a) "In acquisition and processing of ECG signals, augmented leads are always preferred." – Justify in favour of or against the statement.</p> <p>(b) Describe the method of positioning of EEG electrodes as per the international 10-20 system.</p> <p>(c) Draw a typical waveform of ECG. Explain how the different segments of the waveform are related to mechanical and electrical activity of heart.</p>	6+6=12
3.	<p>Write short notes on any TWO. [CO2-K2]</p> <p>a) Types of biopotentials</p>	7+7=14

<p><b>4.</b></p>	<p>b) The role of ion channels and ion pumps in the emergence of Action Potential</p> <p>c) Patch clamp technique</p> <p>Answer any TWO: [CO1-K1]</p> <p>Compare:</p> <p>(a) Neuronal and cardiac Action Potential</p> <p>(b) Spontaneous potential and evoked potential</p> <p>(c) Channel based conduction and saltatory conduction</p>	<p>6x2=12</p>
------------------	---	---------------

**B.E.E. 4TH YEAR 2<sup>ND</sup> SEMESTER EXAMINATION, 2024****SUBJECT: - BIO-MEDICAL INSTRUMENTATION****Time: Three hours****Full Marks 100  
(50 marks for each part)****Use a separate Answer-Script for each part**

No. of Questions	PART-II	Marks																						
Answer Question No. 1 and any three (3) from the rest (14 + 3 X 12 = 50)																								
1.	<p>A two dimensional biomedical data is shown in the table given below. Two dimensions are taken as <math>x</math> and <math>y</math>. Physical significance of each dimension is not disclosed. Find and choose a suitable principal component for the data set to reduce its dimension. Show the modified data.</p> <table><tr><td>x</td><td>y</td></tr><tr><td>8</td><td>5</td></tr><tr><td>4</td><td>1</td></tr><tr><td>6</td><td>3</td></tr><tr><td>8</td><td>6</td></tr><tr><td>8</td><td>5</td></tr><tr><td>11</td><td>8</td></tr><tr><td>5</td><td>3</td></tr><tr><td>9</td><td>5</td></tr><tr><td>7</td><td>4</td></tr><tr><td>8</td><td>2</td></tr></table>	x	y	8	5	4	1	6	3	8	6	8	5	11	8	5	3	9	5	7	4	8	2	14
x	y																							
8	5																							
4	1																							
6	3																							
8	6																							
8	5																							
11	8																							
5	3																							
9	5																							
7	4																							
8	2																							
2.	What are Korotkoff sounds? Explain oscillometric method of blood pressure measurement with necessary diagram. Compare between auscultatory and oscillometric methods of blood pressure measurement.	2+6+4																						
3.	What are the importance of pulse oximetry? Explain the basic principle of optical absorption difference based oximetry. Describe a suitable signal amplifier for this application with explanations.	2+5+5																						
4.	What are the importance of Biometrics in Biomedical Applications? Briefly explain some common biometric traits for authentication.	2+10																						
5.	Write short notes on the following topics (Any two)	6+6																						
a)	Comparison of Computed (Axial) Tomography, MRI and PET Scan related to biomedical instrumentation																							
b)	Impedance plethysmography																							
c)	“Eigenface” based biometric authentication																							