APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code : CSP0821311C-I **(Pages: 2)**

Name: .....

Reg. No: .....

THIRD SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2021

Branch: Electronics and Communication Engineering

Specialization: Communication Engineering and Signal Processing

08EC7211(C) BIOMEDICAL SIGNAL PROCESSING

(Common to CESP AND ECE)

Time: 3 hours **Max. marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q.no.	Module 1	Marks
1.a	Draw a typical ECG waveform over one cardiac cycle indicating the important component waves, their typical durations and the typical intervals between them. Label each wave or interval with the corresponding cardiac event or activity.	3
	Answer b or c	
b	Explain 12-lead system in ECG recording with the help of diagrams.	6
c	Discuss on random noise, structured noise and physiological interference.	6

Q.no	Module 2	Marks
2.a	Explain how you would apply synchronized averaging to remove noise in ECG signals.	3
	Answer b or c	
b	Propose a time-domain technique to remove random noise given only one realization of the signal or event of interest.	6
c	A filter is given by the difference equation $y(n) = y(n-1) + \frac{1}{4}x(n) - \frac{1}{4}x(n-4)$. What is its transfer function? Draw the signal-flow diagram of a realization of the filter and its pole-zero diagram.	6

Q.no.	Module 3	Marks
3.a	Why is the ST segment of the ECG relevant in diagnosis?	3
	Answer b or c	
b	Give an account of the various epochs in an ECG waveform and their intervals.	6
c	Briefly explain electrical activity of the heart. What is the significance of Einthoven's triangle?	6

Q.no.	Module 4	Marks
4.a	Explain the reasons for widening of the QRS complex in the case of certain cardiac diseases.	3
	Answer b or c	
b	Propose an algorithm to detect QRS complexes in an ongoing ECG signal.	6
c	Design a frequency-domain filter to remove periodic artifacts such as power-line interference.	6

Q.no.	Module 5	Marks
5.a	Explain the applications of EEG.	4
	Answer b or c	
b	Propose a method to detect the presence of the α rhythm in an EEG channel. How is it extended to detect the presence of the same rhythm simultaneously in two channels?	8
c	With the help of block diagram explain the brain-computer interface.	8

Q.no.	Module 6	Marks
6.a	Discuss features of the EEG that make the signal nonstationary.	4
	Answer b or c	
b	Explain the characteristics and processing of common artifacts in EEG.	8
c	With a suitable algorithm, substantiate the adaptive segmentation of EEG signals.	8