

**APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY  
08 PALAKKAD CLUSTER**

Q. P. Code : CSP0819211C-I

(Pages: 2)



Name: .....

Reg. No: .....

**THIRD SEMESTER M.TECH. DEGREE EXAMINATION December 2019**

**Branch: Electronics&Communication Specialization: Communication Engineering & Signal Processing**

**08EC7211(C) BIOMEDICAL SIGNAL PROCESSING**

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
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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
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Answer b or c

b	Explain 12-lead system in ECG recording with the help of diagrams.	6
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c	Discuss on common types or sources of artifact in a biomedical instrument.	6
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Q.no	Module 2	Marks
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2.a	Explain how you would apply synchronized averaging to remove noise in ECG signals.	3
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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
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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
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**Q.no.** **Module 3** **Marks**

**3.a** What is the relevance of ST segment detection in ECG analysis? **3**

**Answer b or c**

**b** Give an account of the various epochs in an ECG waveform and their intervals. **6**

**c** Briefly explain the electrical activity of the heart. **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** Discuss on sleep disorders. **4**

**Answer b or c**

**b** Propose a method to detect the presence of the  $\alpha$  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 on medical image formats. **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**