PCET LIBRARY BANGALORE-49

CBCS SCHEME

USN | | | | | | | | | | |

21EC734

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026
Biomedical Signal Processing

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain standard and augmented limb leads. Draw the standard 12-lead clinical ECG. Derive the expression for augmented limb lead av_α. **(10 Marks)**

b. Explain Carotid Pulse. **(05 Marks)**

c. Draw and explain a typical analog to digital signal conversion system. **(05 Marks)**

OR

2 a. Explain briefly how action potentials are generated and propagated in the human body. **(10 Marks)**

b. Explain the objectives and difficulties encountered in biomedical signal acquisition and analysis (any five). **(05 Marks)**

c. Explain Voltage Scaling D/A Convertor. **(05 Marks)**

Module-2

3 a. With a block diagram explain a typical signal averager. Explain the characteristics of signal suitable for signal averaging. **(10 Marks)**

b. Prove that signal averaging improves SNR by a factor of $\sqrt{m}$, where m is number of repetitions. **(10 Marks)**

OR

4 a. Write the advantages of adaptive filters over the fixed filter. Explain LMS algorithm with a block diagram and relevant expressions. **(10 Marks)**

b. Explain a sine wave model used in 60 Hz adaptive cancellation. **(10 Marks)**

Module-3

5 a. Given a sequence of 28 data points {b, b, b, b, b, b, b, c, c, c, c, c, c, d, d, d, d, d, e, e, e, e, f, f, f, g, g, h} derive the code words for the data using Huffman coding. Calculate average code word length. **(10 Marks)**

b. For the given pattern, solve and determine the saved sample for each case using turning point algorithm. **(10 Marks)**

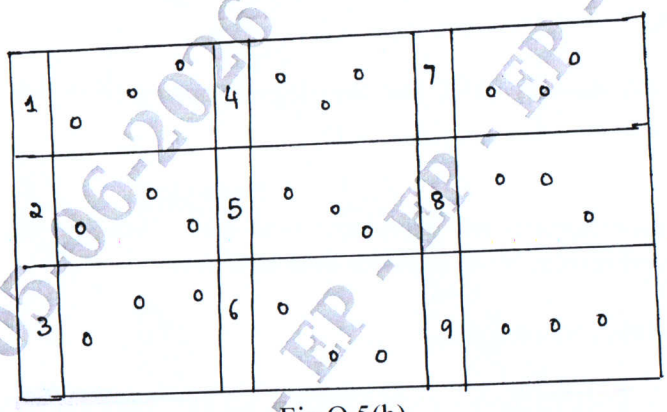

Fig.Q.5(b)

OR

6 a. Define Parseval's Theorem. Determine the periodogram estimate for the power spectrum defined for (N/2 + 1) frequencies. **(10 Marks)**

b. Explain correlation in time domain. **(05 Marks)**

c. Reconstruct the original signal for the given AZTEC coded data. **(05 Marks)**
AZTEC coded data : {15, 80, 5, 100, -8, -200, -5, 150, 25, 150}

Module-4

7 a. Explain PAN Tompkin's based real time QRS detection algorithm. **(10 Marks)**

b. Explain any two template matching techniques for QRS detection. **(10 Marks)**

OR

8 a. Write a note on ST segment analyzer. **(08 Marks)**

b. With a block diagram, explain the steps in ECG interpretation. **(06 Marks)**

c. With a block diagram, explain portable arrhythmia monitor. **(06 Marks)**

Module-5

9 a. With a basic configuration of neuron, explain electrophysiological origin of brain waves. **(10 Marks)**

b. Explain EEG signal and its characteristics. **(10 Marks)**

OR

10 a. With figure explain EEG events and transients. **(10 Marks)**

b. Explain different methods of EEG Analysis. **(10 Marks)**

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