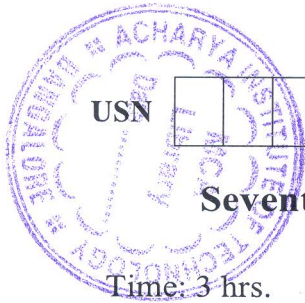


# CBCS SCHEME



USN

--	--	--	--	--	--	--	--	--	--

18MT751

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024

## Biomedical Signal Processing

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. With a block diagram, explain the objectives of bio-medical signal analysis. (08 Marks)
- b. Starting from mesh equations of potential difference between the limbs, RA, LA and LL, derive an expression for  $aV_L$  and also represent vector graph solution. (08 Marks)
- c. Describe Cardiac equivalent generator with the help of a block diagram. (04 Marks)

OR

- 2 a. Describe : (i) Action potential (ii) Resting potential (iii) Depolarization (iv) Repolarization (08 Marks)
- b. With a block diagram, describe simple signal conversion system. (06 Marks)
- c. Describe difficulties encountered in biomedical signal acquisition and analysis. (06 Marks)

### Module-2

- 3 a. Describe the basics of signal averaging. Prove that signal averaging techniques improve SNR by factor of  $\sqrt{m}$ , where m is number of sweeps. (10 Marks)
- b. Describe 60 Hz adaptive canceling using a sine wave models. (10 Marks)

OR

- 4 a. Describe signal averager with block diagram. Explain flow chart of signal averaging program. Illustrate the limitations of signal averaging techniques. (10 Marks)
- b. Describe principal noise canceller modes. (05 Marks)
- c. Describe any two applications of adaptive filtering. (05 Marks)

### Module-3

- 5 a. Along with relevant sketches, describe turning point algorithm. (10 Marks)
- b. Describe correlation in time and frequency domain. (05 Marks)
- c. Describe the Fourier transform of periodic and non-periodic signals. (05 Marks)

OR

- 6 a. Describe FAN algorithm along with illustrative sketches. (10 Marks)
- b. Explain power spectral estimation with relevant mathematical equations. (05 Marks)
- c. Explain convolution in time and frequency domain. (05 Marks)

### Module-4

- 7 a. Explain different template matching techniques of QRS detection. (10 Marks)
- b. Explain QRS detection algorithm. (10 Marks)

OR

- 8 a. Write a note on ST segment analysis. (06 Marks)
- b. With a neat block diagram, explain portable Arrhythmia monitor. (08 Marks)
- c. Briefly discuss ECG lead system. (06 Marks)

**Module-5**

- 9 a. Describe the electrophysiological origin of brain waves with diagram. (07 Marks)  
b. Describe different component waves of EEG signals. (07 Marks)  
c. Explain adaptive segmentation algorithm. (06 Marks)

OR

- 10 a. Describe different events and transients that occur in EEG signals. (08 Marks)  
b. Explain the principle of detection of EEG rhythms. (06 Marks)  
c. Explain how a matched filter can be used to detect spike and wave complexes in EEG signal. (06 Marks)

\*\*\*\*\*