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B. TECH
(SEM VIII) THEORY EXAMINATION 2022-23
BIOMEDICAL SIGNAL PROCESSING

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

(a) Differentiate between general purpose microprocessors and DSP.
(b) What are the dominant frequencies in sleep EEG and their nomenclature?
(c) What is QRS complex?
(d) What is the use of FAN algorithm?
(e) What is meant by EP estimation?
(f) What the different patterns of brain wave?
(g) Define action potential and resting potential.
(h) What is the need of data reduction in biomedical signal processing?
(i) What do you mean by sleep EEG?
(j) What are the different types of biomedical signals?

SECTION B

2. Attempt any *three* of the following: 10x3=30

(a) With a neat block diagram, explain the objectives of biomedical signal analysis.
(b) Explain briefly about portable arrhythmia monitor with a neat sketch.
(c) Explain three approaches for QRS detection?
(d) Explain briefly the different methods of EEG analysis by spectral estimation.
(e) What is adaptive wavelet detection? Explain the detection of overlapping wavelets.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) Explain the run length encoding of data reduction.
(b) Given a biomedical signal, identify discrete signal epochs and correlate them with events in the related physiological processes.

4. Attempt any *one* part of the following: 10x1=10

(a) What is the importance of signal averaging? Explain with block diagram the typical signal average. Draw the flow chart for averaging an ECG signal.
(b) Explain the meaning of lossless and lossy data compression. Classify the data reduction algorithms. Give the algorithm for anyone of the lossless techniques.

5. Attempt any *one* part of the following: 10x1=10

(a) Explain why an AZTEC reconstructed waveform is unacceptable to a cardiologist. Suggest ways to eliminate the problem.

(b) Justify the Markov model for studying sleep EEG. Why it may not be appropriate when dealing with influence Factors that affect sleep? Explain.

6. Attempt any *one* part of the following: 10x1=10

(a) AZTEC encodes a signal from an 8-bit analog-to-digital converter as (2, 50, -4, 30, -6, 30, -4, 50, 2, and 50).
(i) What is the amount of data reduction?
(ii) What is the peak-to-peak amplitude of a signal reconstructed from these data?

(b) Explain the removal of baseline wander and power line interference from ECG.

7. Attempt any *one* part of the following: 10x1=10

(a) Describe transition, detection and estimation of Epilepsy in detail.

(b) In a signal averaging application, the noise amplitude is initially 4 times as large as the signal amplitude. How many sweeps must be averaged to give resulting signal to noise ratio of 4:1?