PAPER ID-420212

Roll No:

BTECH
(SEM VIII) THEORY EXAMINATION 2021-22
BIO MEDICAL SIGNAL PROCESSING

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

Notes: Assume any missing data.

SECTION-A

Q.1 Attempt all parts. Write answer of each part in short.   **(2 x 10=20)**

   (a) Enumerate different types of biomedical transducer?
   (b) Define the terms: bradycardia, tachycardia and arrhythmia in electrocardiography.
   (c) What is ERG?
   (d) Define Joint probability
   (e) Write the name of different biomedical signal.
   (f) Enumerate the differences between direct and indirect measurement of blood pressure.
   (g) What does maximum entropy method state?
   (h) Name and explain the type of amplifier used in ECG that amplifies the ECG signal while not essentially amplifying the disturbance signal.
   (i) What are the different patterns of brain wave?
   (j) What you mean by EP estimation?

SECTION-B

Q.2 Attempt any three questions from this section.   **(10 x 3=30)**

   (a) What is most common artifact observed in ambulatory ECG? Explain
   (b) Propose an algorithm to detect QRS complexes in an ongoing ECG signal.
   (c) Explain how time frequency analysis is helpful in biomedical signal processing.
   (d) Discuss the electric activity of the heart. What is the significance of the Einthoven's triangle?
   (e) Design a low pass filter using Kaiser window.
   (f) Write short notes on:
      i. Use of MATLAB on biomedical signals.
      ii. Laser applications in bio-medical field.

SECTION-C

Q.3 Attempt any one questions from this section.   **(10 x 1=10)**

   (a) After applying the AZTEC algorithm to a signal, the saved data array is {2, 50, -4, 30, -6, 50, -6, 30, -4, 50, 2, 50}.
      i. Draw the waveform that AZTEC would reconstruct from these data.
      ii. What is the amount of data reduction?
      iii. What is the peak-to-peak amplitude of a signal reconstructed from these data?
   (b) Explain the principles of Adaptive noise canceller with an example.

Q.4 Attempt any one questions from this section.   **(10 x 1=10)**

   (a) Given a biomedical signal, identify discrete signal epochs and correlate them with events in the related physiological processes.
   (b) Explain briefly the different methods used for EEG analysis by spectral estimation

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Q.5 Explain any one questions from this section. **(10 x 1=10)**

(a) The details about auto correlation and cross correlation.
(b) Write short note on Analog to Digital conversion.

Q.6 Explain any one questions from this section. **(10 x 1=10)**

(a) The input of a casual linear shift-invariant system is

$$x(n) = u(-n-1) + \left(\frac{1}{2}\right)^n u(n).$$

The Z-transform of the output of this system is

$$y(z) = \frac{-\frac{1}{2}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)(1 + z^{-1})}$$

Find the system function H(z) of the filter.
(b) Explain the principles of Adaptive noise canceller with suitable example

Q.7 Explain any one questions from this section. **(10 x 1=10)**

(a) The table below shows a set of 20 data points of an ECG sampled with an 8-bit analog-to-digital converter.

Number	Frequency of occurrence	Huffman code
-10	2	
0	10	
10	3	
20	4	
60	1	

(i) Draw a Huffman binary tree including the probabilities of occurrence for this set of data.
(ii) From the binary tree, assign appropriate Huffman codes to the numbers in the data array.
(b) Write short note on Wavelet detection and Adaptive wavelet detection.