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Reg. No.....

Name.....

M.Sc. (BIOMEDICAL INSTRUMENTATION) DEGREE EXAMINATION OCTOBER 2023

Fourth Semester

BIOSIGNAL PROCESSING

(2021 Admissions–Regular/2016–2020 Admissions–Supplementary/Mercy Chance)

Time : Three Hours Maximum Marks : 100

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain with a diagram the characteristics and properties of PCG signals.
2. Discuss on the properties of discrete time signals.
3. State and prove theorems in Z-transform.
4. Explain how discrete time signals are analized in frequency domain.
5. What are the properties of Discrete Fourier transform ?
6. What is block convolution ? How is it calculated ?
7. Write a note on Butterworth approximation used in the design digital filters.
8. Discuss on bilinear transformation method.
9. Compare the characteristics of Hamming, Hanning and rectangular windows.
10. Explain the role of DSP techniques in the evaluation of ECG signals.
11. Explain the properties of discrete Fourier series.
12. Write a brief account on the realization methods of IIR filters.

(10 × 5 = 50)

Part B

Answer any **five** *questions.*
Each question carries 10 *marks.*

1. Determine whether the following system is (i) causal ; (ii) stable ; and (iii) LTI :

$y(n) = e^{-x(n)}$.

Turn over

2. Determine the inverse z-transform of :

$$F(z) = \left[5 - 2z^{-1} + z^{-2}\right] / \left[\left(1 + z^{-1}\right)^2 \left(1 - z^{-1}\right)^2\right]$$

ROC : $|Z| > 1$

3. Compute the circular convolution of the following sequences and compare it with linear convolution :

$x(n) = \{1, 1, -1, -1\}$; $h(n) = \{4, 3, 2, 1\}$.

4. Compute the 8-point DFT of the following sequence using DIT algorithm :

$x(n) = \{2, 1, 2, 1, 2, 1, 2, 1\}$.

5. Determine (i) direct form ; (ii) parallel form and (iii) cascade form structures for the system :

$$H(z) = \left(1 + z^{-1}\right)^3 \Big/ \left[\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - z^{-1} + \frac{1}{2}z^{-2}\right)\right].$$

6. Explain with suitable examples the frequency transformation technique of designing IIR filters.

(5 × 10 = 50)