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Reg. No................................

Name...................................

M.Sc. (BIOMEDICAL INSTRUMENTATION) DEGREE EXAMINATION SEPTEMBER 2025

Fourth Semester

BIOSIGNAL PROCESSING

(2023 Admissions – Regular/2021–22 Admissions – Supplementary/2020 Admissions – First Mercy Chance/2019 Admissions – Second Mercy Chance/2018 Admissions – Final Mercy Chance)

Time : Three Hours | Maximum : 100 Marks

Part A

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

1. (a) Discuss the properties of discrete time signals. (5)

   (b) Inspect whether the system $y(n) = \ln\left[x(n)\right]$ is linear and time invariant. (5)

2. Determine whether the following system is (i) causal (ii) stable and (iii) LTI : $y(n) = e^{-x(n)}$. (10)

3. (a) A causal LTI system has an impulse response $h(t) = e^{-4t}u(t)$. Using Fourier transform find the output of the system for an input $x(t) = 3e^{-t}u(t)$. (5)

   (b) Explain how discrete time signals are analysed in frequency domain. (5)

4. Find DTFT of the signal $x(n)$.

$$x(n) = \begin{cases} 10 : |n| \le \mathrm{N} \\ 0 \ : |n| > \mathrm{N} \end{cases}$$ (10)

5. (a) Write notes on Decimation in Time and Decimation in Frequency FFT algorithms. (5)

   (b) Explain the properties of the Discrete Fourier series. (5)

6. Obtain the 8-point DIF and DIT FFT of given sequence $\{8,8,8,0,1,4,2,3\}$. (10)

Turn over

7. (a) What is Bilinear transformation ? Give the expressions. (5)

   (b) Compare the characteristics of Hamming, Hanning and rectangular windows. (5)

8. Explain with suitable examples the frequency transformation technique of designing IIR filters. (10)

9. Design a digital FIR band pass filter with lower cut off frequency 2000Hz and upper cut off frequency 3200 Hz using Hamming window of length N = 7. Sampling rate is 10000Hz. (10)

10. Using a rectangular window technique design a lowpass filter with pass band gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7. (10)

11. (a) Explain the limit cycle oscillations due to product round off and overflow errors. (5)

    (b) Explain how reduction of product round-off error is achieved in digital filters. (5)

12. Explain the role of DSP in analysing Evoked Potentials and PCG signals. (10)

[10 × 10 = 100]