

Enrolment Number: \_\_\_\_\_

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.TECH EXAMINATION (MID SEMESTER)**  
**6<sup>th</sup> SEMESTER (EVEN-2024)**

**SUBJECT NAME (CODE): Biomedical Signal Processing (203111355)**

**BRANCH: Biomedical Engg**

**DATE: 29/01/2024**

**TIME: 02:30 P.M. To 04:00 P.M.**

**TOTAL MARKS: 40**

Sr No.		Marks
<b>Q.1 (A)</b>	<b>Multiple Choice Questions:</b>	<b>05</b>
(1)	What is the requirement of Signal processing in Biomedical field?	
(2)	What is the criterion for the system to possess BIBO stability?	
(3)	What are the similarities between Fourier Transform and Z-Transform?	
(4)	All energy signals will have an average power of _____.	
(5)	The deflection voltage of an oscilloscope is a 'deterministic' signal. True/False?	
<b>Q.1 (B)</b>	Compute DFT and Plot the magnitude and phase spectrum of the sampled data sequence {1, 0, 0, 1}, which was obtained using a Sampling frequency of 20kHz and select N=4.	<b>05</b>
<b>Q.2</b>	<b>Attempt any four (Short Questions):</b>	<b>12</b>
(1)	Determine whether the following system are TV or TIV: 1. $y[n] = \cos[x[n]]$ 2. $y[n] = x[n]u[n]$	
(2)	A discrete time signal $x[n]$ is defined as $x[n] = \begin{cases} 1 + \frac{n}{3} & -3 \leq n \leq -1 \\ 1 & 0 \leq n \leq 3 \\ 0 & \text{elsewhere} \end{cases}$ (a) Determine and sketch signal $x[n]$ (b) Sketch signal results: 1. First Fold $x[n]$ and delay resulting signal by four sample. 2. First delay $x[n]$ by four sample and then fold.	

(3) The analog signal given below is sampled by 800 samples per second.

$$X(t) = 2\sin 480\pi t + 3\sin 720\pi t$$

Calculate:

1. Nyquist Sampling Rate
2. Maximum Frequency

(4) Perform Convolution of given sequences using Tabular Method:

$$x[n] = \{1, 1, 1, 1\}, h[n] = \{6, 5, 4, 3, 2, 1\}$$

(5) Define ROC. Determine ZT of given equation:

$$X[n] = [5 [2^n] - 8 [4^n]] u[n]. \text{ Find ROC also.}$$

**Q.3**

**Attempt any two:**

**08**

(1) Define Twiddle Factor. Find out IDFT of Given sequence, using Twiddle Factor.

$$X[k] = \{2, 1+j, 0, 1-j\}.$$

(2) Give the Comparison of DTFT and DFT. Also Compute DFT of the given Signal.

$$x[n] = \{0, 1, 2, 3\}$$

(3) Consider the following sequence

$$x[n] = \{1, 2, -3, 4, 6, 1/2\}$$

Comment on the correctness of following statement "Folding & Delaying = Advance & Folding" giving suitable Proof.

**Q.4 (A)** Perform Circular Convolution of two sequences using Graphical method:

**05**

$$x_1[n] = \{0.2, 0.4, 0.6, 0.8, 1, 1.2, 1.4, 1.6\}$$

$$x_2[n] = \{0.1, 0.3, 0.5, 0.7, 0.9, 1.1, 1.3, 1.5\}$$

**Q.4 (B)** For a given sequence perform following operations:

**05**

$$x[n] = \{2, 0, 0, 1\}$$

$$h[n] = \{4, 3, 2, 1\}$$

- 1) Find 4 point DFT of  $x[n]$  using matrix method.
- 2) Find 4 point DFT of  $h[n]$  using matrix method.
- 3) Perform  $Y[k] = X[k].H[k]$

**OR**

For a given sequence perform following operations:

$$x[n] = \{2, 0, 0, 1\}$$

$$h[n] = \{4, 3, 2, 1\}$$

- 1) Find 4 point DFT of  $x[n]$  using matrix method.
- 2) Find 4 point DFT of  $h[n]$  using matrix method.
- 3) Perform Circular Convolution using Matrix method.