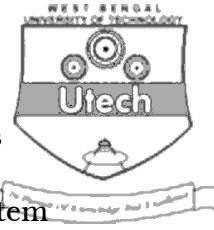


- iii) The system $y(n) = x(n) + nx(n+1)$ is
- Non-causal & time variant
 - Causal & time variant
 - Causal & time invariant
 - Non-causal & time invariant.
- iv) Consider a system of transfer function $X(z) = 1/(1-az^{-1})$. The ROC of the system is
- $|z| > |1/a|$
 - $|z| > |a|$
 - $|z| < |1/a|$
 - $|z| < |a|$.
- v) The Fourier transform of the sequence $x^*(-n)$ is
- $X^*(-\omega)$
 - $X^*(\omega)$
 - $X(-\omega)$
 - $X(\omega)$.
- vi) The Z transform of the sequence $2u(n)$ is
- $1/1-2z^{-1}$
 - $4/2-2z^{-1}$
 - $2/1-2z^{-1}$
 - $1/1-4z^{-1}$.
- vii) We may use convolution to find the output for the
- Linear time variant system
 - Causal system
 - Linear time invariant system
 - Non-causal system.
- viii) For a rectangular window of M samples, width of the main lobe is
- $2\pi/m$
 - $6\pi/m$
 - $4\pi/m$
 - π/m .

- [Turn over



xiv) Infinite memory system is also known as

- a) FIR system
- b) IIR system
- c) Digital system
- d) Analog system.

xv) The even & odd parts of a unit step sequence are

- a) $[1/2 + 1/2\delta(n)], [1/2\delta(n)]$
- b) $[1/2 + \delta(n)], [1/2\delta(n)]$
- c) $[1/2 + 1/2\delta(n)], [1/2\text{sgn}(n)]$
- d) $[1 + \delta(n)], [1/2\delta(n)]$.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

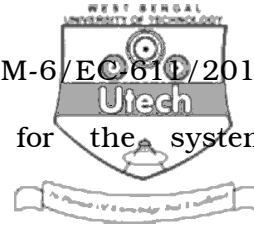
2. Consider the transfer function of an analog filter as $H(s) = (s+3)/(s^2 + 4s+13)$. Now design the digital filter using impulse invariance method. Consider the sampling interval $T=0.1s$.

3. Write short note on any one of the following topics :

- a) Design of FIR filter using windowing technique.
- b) Effect of finite register length on digital system.

4. Compute the circular convolution of the two sequences

$$X1(n) = \{ 2, 1, 2, 1 \} \text{ \& } X2(n) = \{ 1, 2, 3, 4 \}$$



5. Obtain the cascade form structure for the system characterized by

$$y(n) = 3/4y(n-1) - 1/8y(n-2) + x(n) + 1/3x(n-1).$$

6. Design a low-pass digital filter with a 3 dB bandwidth of 0.2π . Use Bilinear transformation applied to the analog filter

$$H_a(s) = \Omega_c / (s + \Omega_c).$$

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Find the circular convolution of two sequences $x_1(n) = \{1, 1, 2, 2\}$ and $x_2(n) = \{1, 2, 3, 4\}$.

- b) State and prove the initial value theorem regarding Z-transform.

- c) Determine the DFT of the sequence

$$x_1(n) = \frac{1}{4} \text{ for } 0 \leq n \leq 2$$

$$= 0 \text{ for otherwise.}$$

$$7 + 3 + 5$$

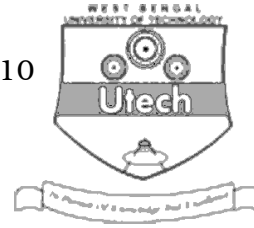
8. a) Discuss about design method of low-pass filter.

- b) What is rectangular window ?

- c) How is a rectangular window used to design FIR filter ?

- d) Determine the IDFT of $X(k) = \{ 3, (2 + j), 1, (2 - j) \}$.

$$4 + 2 + 4 + 5$$



9. a) Find $x(n)$ by using convolution for

$$X(z) = \frac{1}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{4}z^{-1}\right)}.$$

- b) Find the inverse z-transform of

$$X(z) = \frac{1}{(z - 0.25)(z - 0.5)}, \text{ ROC : } |z| > 0.5.$$

- c) Check whether the following digital system is BIBO stable or not :

$$y(n) = ax^2(n). \quad 6 + 5 + 4$$

10. a) Discuss in brief on the effect of Finite Register Length in Digital Signal Processing.

- b) Using Linear Convolution find $y(n) = X(n)^* h(n)$ for the sequence $X(n) = (1, 2, -1, -2, 0, 1, 3, -1)$ and $H(n) = (1, 2)$. Compare the result by solving the problem using (i) Overlap Save Method (ii) Overlap Add method.

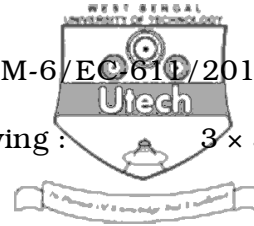
- c) For the difference equations in which $x(n)$ is input and $y(n)$ is output $y(n) = 3y^2(n-1) - nx(n) + 4x(n-1) - 2x(n-1)$

Determine whether the system is

- i) linear
- ii) time invariant
- iii) causal.

In each case justify the answer.

4 + 7 + 4



11. Write short notes on any *three* of the following : 3×5

- a) Circular convolution
- b) Utility of FFT over DFT
- c) BIBO stability in Z domain
- d) Architecture of digital Signal processor
- e) Mapping of S-plane into Z-plane.

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