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53 (IE 403) LSYS

2019

**LINEAR SYSTEM AND SIGNALS**

Paper : IE 403

Full Marks : 100

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

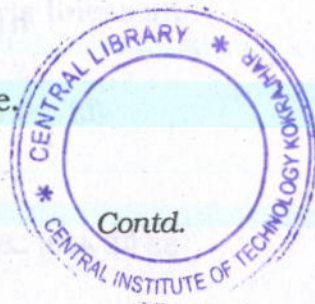
Answer **any ten** questions.

1. A discrete time causal system has a transfer

$$\text{function } H(z) = \frac{(1 - z^{-1})}{(1 - 2z^{-1} - 5z^{-1})}$$

4+3+3

- (a) Determine the difference equation of the system.
- (b) Show pole and zero.
- (c) Find the impulse response.



2. A discrete-time sequence  $x(n) = \{5, 2, 3, (-5), 1, 3, 6, 4, 8\}$  find the

(a)  $x(-n)$

(b)  $x(2n)$

(c)  $x(n-2) \cdot \delta(n-1)$

(d)  $x(n+1) + x(n-1)$

(e) even part of  $x(n)$ . 2x5

3. (a) State the significance of impulse response.

(b) What are the conditions for a system to be LTI? 5+5

4. Compute the convolution of these pair 5+5

(a)  $x(n) = \{1, (0), 2, 5, 9\}$   
 $h(n) = \{1, 0, (3), 4, 5\}$

(b)  $x(n) = \{5, 2, 2, 5\}$ ;  $h(n) = u(n)$ .

5. (a) Determine the power and RMS value of the following signals :

$$y(t) = \cos\left(100\pi t + \frac{\pi}{6}\right)$$

and  $y(t) = 5\cos t + \cos(10\pi t)$

(b) Find  $\sum u(n)$  and  $\sum \delta(n)$ .

6. (a) Find fundamental period of following signals

$$x(t) = 4\cos 5t; \quad x(n) = \cos 5n$$

(b) Compute the correlation of these of sequence.

$$x(n) = \{1, 2, -1\}$$
$$h(n) = \{1, 0, 4\}$$

7. (a) Check the Causality of  $y(n) = x(2n)$

(b) Verify whether the given systems described by the equation is linear time invariant or not.

$$y(t) = 5x(t^2)$$



8. (a) Define symmetric and anti-symmetric sequence with examples. 5

(b) What are the conditions for a system to be LTI? 5

9. (a) Write down the classification of system. 5

(b) Determine the causal signal  $x(n)$  having the z-transform 5

$$X(z) = \frac{(1+z^{-1})}{(1+3z^{-1})(1+z^{-1})}$$

10. (a) What is aliasing? 5

(b) Write the 4th order difference equation. 5

11. (a) Write the block diagram of DSP. 5

(b) Draw the sequence  $u(n) - u(n-5) + \delta(n)$ . 5

12. (a) Define Fourier transform and its inverse. 5

(b) Why Digital system is less sensitive to tolerances and cheaper? 3+2=5

13. (a) Exact linear phase filter design possible in DSP. Explain. 5

(b) Why Bandwidth is limited in DSP? 5

