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 function $H(z)=\dfrac{\left(1-z^{-1}\right)}{\left(1-2z^{-1}-5z^{-1}\right)}$. 4+3+3

   (a) Determine the difference equation of the system.

   (b) Show pole and zero.

   (c) Find the impulse response.

Contd.

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 $x(n)$. 2×5

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 va 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

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

(b) Compute the correlation of these of sequence.

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

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

(b) Verify whether the given sys 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

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

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