53 (IE 403) LSSG

2019

LINEAR SYSTEM AND SIGNAL

Paper : IE 403

Full Marks : 100

Time : Three hours

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

*Answer **any ten** questions out of **thirteen**.*

1. *(a)* Determine the RMS value of

$y(t)=10\sin\left(100t+\frac{\pi}{3}\right)$ and

$y(t)=\sin 2t.\cos 3t$. 6

(b) Find $u(n-1)-\delta(n-2)$. 4

2. *(a)* Determine the causal signal $x(n)$ having the z-transform 6

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

Contd.

(b) Check the linearity and causality of the systems $y(n)=x(n^2)$. 4

3. A discrete time causal system has a transfer function 10

$$H(z)=\frac{(1-z^{-1})}{(1+z^{-1})(1-2z^{-1})}$$

(i) Determine the difference equation of the system.

(ii) Show the pole zero diagram.

(iii) Find the impulse response.

4. (a) Write the definition of symmetric and anti-symmetric signal. Determine the symmetric part of $x(n)=\{1,2,3,4\}$. 6

(b) State the significance of impulse response. 4

5. Compute the convolution of these pair of signals 6+4

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

(b) $x(n)=\{1,1,2,2\}$ $h(n)=\{-1,-2,1,3\}$

6. (a) Compute the correlation of $x(n)=\{1,(0),2,3\}$, $y(n)=\{1,0,4,5\}$ 6

(b) Find the fundamental period T of $x(t)=4\cos 5\pi t$. 4

7. (a) Write the classification of system. 6

(b) Check the periodicity of $\cos(0{\cdot}01\pi n)$. 4

8. (a) Explain the aliasing effect. 6

(b) Test the linearity and time invariant of $y(t)=x(t^2)$. 4

9. (a) Derive the 4th order difference equation from $\frac{d^4x}{dt^4}$. 6

(b) Define Fourier transform. 4

10. A discrete time signal $x(n)=\{5,-4,(5),-1,3,2\}$. Sketch and label : 3+3+4

(i) $x(-n)$ (ii) $x\left(\frac{n}{2}\right)$ (iii) $x(n-3).\delta(n-2)$

11. *(a)* Draw the following :

$u(t)-u(t+2)$ 4

(b) When a system is called non-causal ? 6

12. *(a)* Find the even part of

$x(n)=\{1,3,-5,4,6,-2\}$. 6

(b) When a system is called an active system ? 4

13. *(a)* Prove that $x(t).\delta(t-t_0)=x(t_0).\delta(t-t_0)$. 6

(b) State the Dirichlet's conditions. 4