

P. Pages : 3

Time : Three Hours

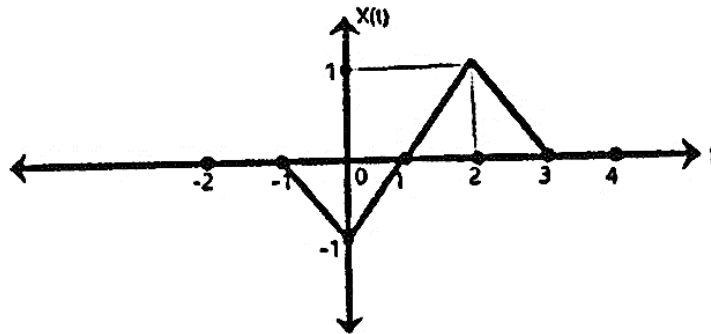
**GUG/S/23/13909**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Given the signal $x(t)$. Sketch the following signals. 8

- i) $x(-t)$;
- ii) $x(t+2)$;
- iii) $x(2t)$;
- iv) $x(t-3)$



b) Determine whether the following systems are periodic or not. If periodic, then determine the fundamental time and frequency. 8

- i) $X(t) = \sin 12\pi t + \cos 20\pi t$
- ii) $X(t) = \cos(10\pi t + \pi/2) + 2\sin 6\pi t$

OR

2. a) Define energy and power signal. Determine whether following signal is energy signal or power signal. 8

$$X(n) = n; n \geq 0$$

$$= 0; n < 0$$

b) Test the following systems for Linearity, Causality, Time invariance and Memory. 8

- i) $Y(t) = 2x(t) + 5$
- ii) $Y[n] = x[n-3] + 2x[n-1]$

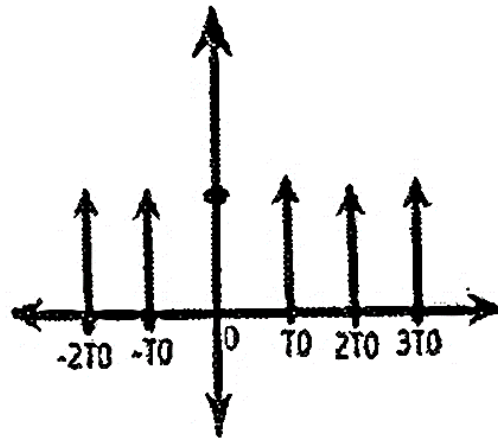
3. a) State and prove the following property of LTI system 8

- i) Associative
- ii) Distributive
- iii) Scaling
- iv) Commutative

- b) Obtained the linear convolution of the given signals $x[n] = \{1, 2, 1, 2\}$ $h[n] = \{1, 1, 1\}$ using convolution using. 8
- Tabular method.
 - Multiplication method.

OR

4. a) Find the circular convolution of the sequence $x[n] = \{3, 2, -1, -2, 3, 2\}$ $h[n] = \{3, 2, 2\}$ 8
- b) Given $h[n] = \{1, 3, 1, 2\}$ is the impulse response of LTI system. Determine response of the system to the input signals $[n] = \{2, 1, 1, 2\}$. 8
5. a) Obtain Fourier Transform of impulse train shown in figure. 8



- b) Obtain DFT of discrete time signal $x[n] = \{2, 1, 3, 2\}$ 8

OR

6. a) State & derive the convolution property of DFT. 5
- b) Determine Fourier coefficient for given signal 5
- $$X(t) = 3\sin 3\omega_0 t + \frac{1}{2}\cos \omega_0 t - 1/3\sin (7\omega_0 t + \pi/3)$$
- c) State & prove time reversal property of Fourier transform. 6
7. a) Determine the step response of the following causal system. 8
- $$y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n)$$
- b) What is ROC of Laplace transform? State its properties. 8

OR

8. a) State and prove the convolution property of Z-Transform. 8

- b) If 8

$$Y(z) = \frac{1 - 3z^{-1}}{(1 - 1/2z^{-1})(1 - 2z^{-1})}$$

Find the inverse Z-Transform if –

- i) System is stable
- ii) System is causal
- iii) System is anticausal.

9. a) Analog signal is given as $x_a(t) = \sin 5\pi t + 2\sin 10\pi t + 2\cos 15\pi t$, Determine 8

- i) Nyquist rate of signal
- ii) If signal is sampled with $f_s = 20\text{Hz}$, find discrete time signal obtained after sampling?

- b) Explain the properties of Laplace transform. 8

- i) Time shifting.
- ii) Transform of derivative property.

OR

10. a) State and prove sampling theorem. 8

- b) Write a short note on. 8

- i) O-order hold sampling.
- ii) Interpolation.
