

B.E. Computer Science & Engineering (MODEL CURRICULUM) Sem-V
TEE101CS : Signals and System

P. Pages : 3

Time : Three Hours



GUG/W/22/13811

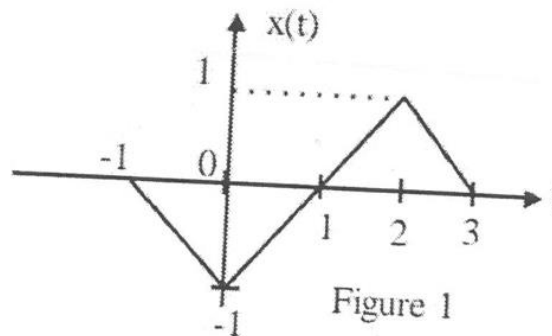
Max. Marks : 80

- 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) Describe in brief following discrete time system with an examples. 8
- i) Static and dynamic system.
 - ii) Time invariant system and time variant systems.
 - iii) Linear and non linear system.
 - iv) Stable and unstable system.
- b) Determine whether or not each of the following signal is periodic. If a signal is periodic, specify its fundamental period. 8
- i) $x(n) = e^{j7\pi n}$
 - ii) $x(n) = 1 + e^{j\frac{4\pi n}{7}} - e^{j\frac{2\pi n}{5}}$

OR

2. a) Sketch the following signals 8
- i) $x(-t)$
 - ii) $x(t+2)$
 - iii) $x(2t)$
 - iv) $x(t-3)$
- if $x(t)$ is

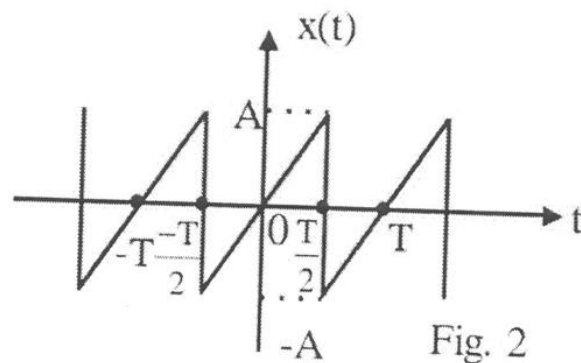


- b) Show that the energy (Power) of a real-valued energy (Power) signal is equal to the sum of the energies (Powers) of its even and odd components. 4
- c) Consider a discrete – time system with input $x(n]$ and output $y(n]$. The input output relationship for this system is $y(n] = x(n]x(n-2]$ 4
- i) Is this system memory less?
 - ii) Determine the output of the system when the input $A\delta(n]$, Where A is any real or complex number.

3. a) List out the properties of LTI system. Describe any two with details. 8
- b) Compute the following convolution. 8
- i) $x(n) = \{1, -2, -1, 0, 1\}$
 \uparrow
 $h(n) = \{1, 2, 3, 0\}$
- ii) $x(n) = \delta(n) + 2\delta(n-1) - \delta(n-3)$
 $h(n) = 2\delta(n+1) + 2\delta(n-1)$

OR

4. a) Compute the discrete convolution $y(n) = x(n) * h(n)$ of the signals 8
 $x(n) = h(n) = \alpha^n \cdot u(n)$.
- b) Find out whether the following signal is periodic or non-periodic. If periodic find the fundamental period. 8
- i) $x(t) = \cos(10\pi t + \pi/2) + 2\sin(6\pi t)$
- ii) $x(n) = e^{-j\frac{3\pi}{2}n}$
5. a) Determine the Fourier series representation of the following discrete time signal 8
 $x(n) = \{ \dots, 2, 3, -2, 2, 3, -2, 2, 3, -2, \dots \}$
- b) Determine the trigonometric form of Fourier series for the signal shown in fig. 2. 8



OR

6. a) State and prove the Parseval's Theorem with respect to Fourier Transform. Comment on it. 8
- b) Obtain Fourier series coefficient of the following signal 4
 $x(t) = 1 + 2\cos(\omega_0 t) + 3\sin(2\omega_0 t) + \cos(3\omega_0 t)$
- c) State and derive the convolution property of DFT. 4

7. a) State and prove the convolution property of Z-transform. 8
- b) Make use of the Shifting property and find the Fourier transform of 8
- i) $y_1(t) = e^{-2t}u(t-3)$
- ii) $y_2(t) = \text{rect}\left(\frac{t-1}{2}\right)$

OR

8. a) A discrete-time signal is given as $x(n) = a^n \cdot U(n)$ for $-1 < a < 1$. Determine and sketch the energy density spectrum $\psi(e^{j\omega})$. 8
- b) If $Y(z) = \frac{1-3z^{-1}}{(1-1/2z^{-1})(1-2z^{-1})}$ 8
- Find the inverse Z-transform if-
- i) System is stable
- ii) System is causal
- iii) System is anticausal
9. a) Explain the properties of Laplace transform. 8
- i) Time shifting.
- ii) Transform of derivative property.
- b) An analog signal is given as $x_a(t) = \sin(100\pi t) + 2\sin(200\pi t) + 3\cos(300\pi t)$ 8
- i) What is the Nyquist rate of this signal
- If the signal is sampled with $F_s = 200$ Hz, What is the discrete time signal obtained after sampling?

OR

10. a) Describe any one method of reconstruction of continuous time signal from its equivalent discrete time signal. 8
- b) State and prove sampling theorem. 8
