MID TERM-1 EXAMINATION

Sem: **2nd (B.Tech.)** Course Name: **Signals and Systems** Course Code: **EC0101**

Time: **$1\frac{1}{2}$ Hours** Date: **19/04/2023** Max. Marks: **20**

Name: ..... **Roll no.:**.....

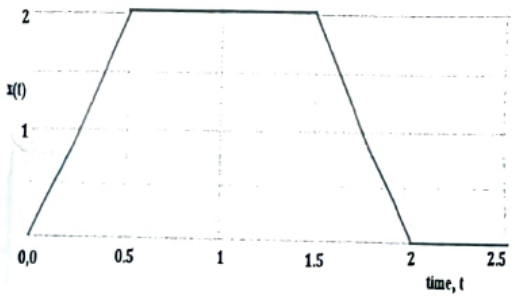
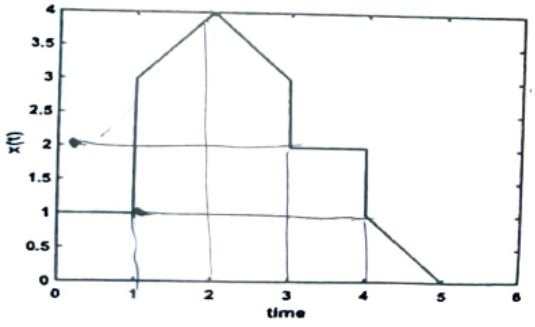
Instruction:

A. *All questions are compulsory*

B. *Each question carries equal marks.*

C. *If required, consider the necessary assumptions.*

D. *Calculator is allowed.*

Q. No		Description of Questions	Marks
1	a)	A continuous time $x(t)$ is given as $x(t) = x_1(t) + x_2(t) + x_3(t)$, where $x_1(t) = 10\sin(2\pi \times 10^{-4}t)$, $x_2(t) = 5\cos(4\pi \times 10^{-4}t)$, and $x_3(t) = \lvert 10\cos(2\pi \times 10^{-4}t)\rvert$.	
		i) Check the periodicity of the signal, $x(t)$?	2
		ii) If it is periodic, then find its time period ?	
	b)	Write the expression of the given signal $x(t)$? 	2
2	a)	Determine the even and odd components of the signal $x(t) = t(1-t^2)(1+4t^2)$?	2
	b)	Draw the following transformations of the $x(t)$ signal 	
		i) x(t/2)	
		ii) x(4-3t) ?	2

3 a) The signal is defined as,

$$x(t) = \begin{cases} 5-t, & 4 \le t \le 5 \\ 1, & -4 \le t \le 4 \\ t+5, & -5 \le t \le -4 \\ 0, & otherwise \end{cases}$$

. Determine total energy of the signal $x(t)$? 2

b) Determine which of these properties hold and which do not hold for each of the following continuous-time system (i) Memoryless (ii) Time invariant (iii) Linear (iv) Causal. Justify your answers. $y(t) = \begin{cases} 0, & t < 0 \\ x(t) + x(t-2), & t \ge 0 \end{cases}$ 2

where $y(t)$ denotes the system output and $x(t)$ is the system input.

4 a) Justify in detail whether the following system is invertible or not? 2

$$y(n) = cos(2\pi n)x(n)$$

b) Given $x(n) = \{1, -1, 2, 1, 3\}$ and $h(n) = \{2, 1, -1, 2\}$. Determine and plot the signals $y(n) = x(n) \otimes h(n-2)$? where $\otimes$ denotes convolution. 2

5 a) An impulse response of a continuous time LTI system is given as $h(n) = \alpha^n[u(n) - u(n-5)]$. Find the stability of the system? Where $u(n)$ denotes unit step signal. 2

b) The input-output of a LTI system is expressed as $2y(n) + 6y(n-1) = x(n) - x(n-1)$. Determine the impulse response of the system? Assume that system is causal. 2