U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

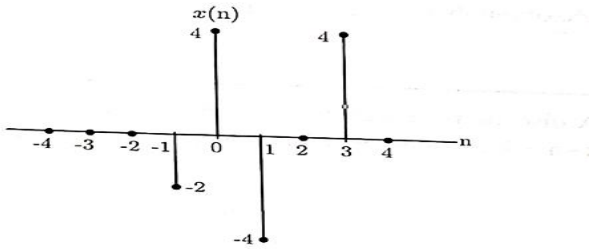
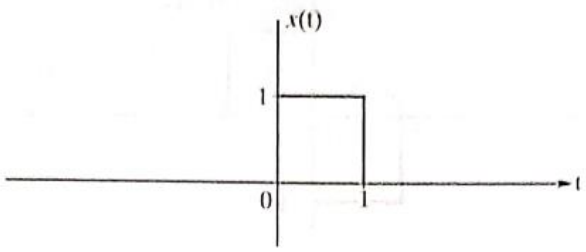
Programme: B.E. **Semester: IV**

Branch: Electronics & Instrumentation Engineering **Duration: 3 hrs.**

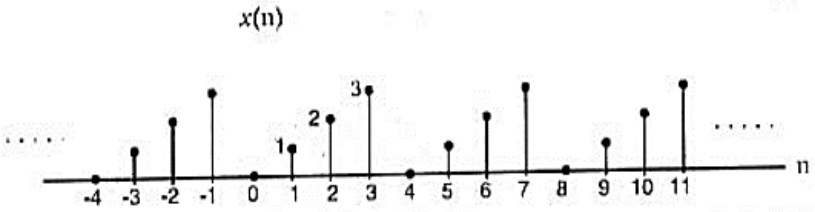
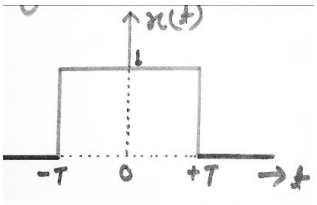
Course Code: 23EI4PCSAS **Max Marks: 100**

Course: Signals and Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	CO	PO	Marks
1	a)	Describe the elementary signals with appropriate equations and plots.	CO2	PO1	**10**
	b)	For the discrete time signal shown below, Sketch the following signal.  i) 2x(n-2) ii) 3- x(n) iii) 2x(-n)-4 iv) 1+2x(-2+n)	CO2	PO1	**10**
		OR			
2	a)	Classify different types of signals with necessary plots and equations.	CO1	-	**10**
	b)	Analyze the given signal and Sketch the even and odd parts of the signal i) x(n)= {2,3,4,5,6} ; Consider origin at 4 ii)  	CO2	PO2	**10**

			UNIT - II			
	3	a)	For the following systems, determine whether the system is Linear, Time invariant, Memoryless, Causal and Stable i) $y(t) = \frac{d}{dt}\{e^{-t}\, x(t)\}$ ii) $y(t) = x(\frac{t}{2})$ iii) $y(n) = x(n)\sum_{-\infty}^{\infty}\delta(n-2k)$ iv) $y(n) = x(n) + nx(n+1)$	*CO2*	*PO1*	**10**
		b)	Determine whether the following systems are invertible or not, if it is construct the inverse system. i. $y(n) = n\, x(n)$ ii. $y(t) = x^3(t)$ iii. $y(t) = \frac{6}{5}x(-3-t)$ iv. $y(t) = \int_{-\infty}^{t} x(\tau).d\tau$ v. $y(t) = x\left(\frac{t}{4}\right)$	*CO2*	*PO1*	**10**
			OR			
	4	a)	For the following systems, determine whether the system is Linear, Time invariant, Memoryless, Causal and Stable i) $y(t) = \frac{dx(t)}{dt}$ ii) $y(t) = e^{x(t)}$ iii) $y(n) = \cos(x(t))$ iv) $y(n) = x(n) + u(n+1)$	*CO2*	*PO1*	**10**
		b)	For the following systems, determine whether the system is Invertible or not? If invertible construct inverse system i) $y(t) = x(t-6)$ ii) $y(t) = x(1-n)$	*CO2*	*PO1*	**06**
		c)	Determine the overall operator of the following systems whose output signal is given by and also represent the block diagram m $y(n) = 0.3[x(n) + x(n-1) + x(n-2)]$	*CO2*	*PO1*	**04**
			UNIT - III			
	5	a)	Design the total response of the system given by the following differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2x(t)$ $y(0) = 0\,;\, \frac{dy(t)}{dt} = 1;\ for\ t = 0$ $x(t) = cost\ u(t)$	*CO3*	*PO2*	**10**
		b)	Evaluate the continuous –time convolution integral given below $y(t) = \{u(t+2) - u(t-1)\} * u(-t+2);$ |	*CO4*	*PO1*	**10**

			OR			
	6	a)	Design the force response described by the following difference equation $y(n) - 0.25y(n-1) - 0.125y(n-2) = x(n) + x(n-1)$ $with\ input\ x(n) = 0.125^n u(n)$	*CO3*	*PO2*	**10**
		b)	Draw the direct form-I and Direct form-II implementation for the system defined by the following differential equation: $\frac{d^2y(t)}{dt^2} - 6\frac{dy(t)}{dt} - 4y(t) = x(t) - 5\frac{dx(t)}{dt}$	*CO4*	*PO1*	**06**
		c)	Perform the convolution sum of the sequences given below: x(n)={1,2,3,1} and h(n)={1,2,1,-1} ↑ ↑	*CO4*	*PO1*	**04**
			UNIT - IV			
	7	a)	Evaluate the DTFS representation for the signal x(n) as shown below figure(7a) and sketch the spectra. Also verify Parseval's identity  figure(7a)	*CO4*	*PO1*	**10**
		b)	The system produces the output of $y(t) = e^{-t}u(t)$ for an input of $x(t) = e^{-2t}u(t)$. Determine the frequency response and impulse response of the system.	*CO4*	*PO1*	**10**
			OR			
	8	a)	Evaluate the Fourier transform of the following signal. Obtain the expression for the magnitude and phase spectra. i) $x(t) = (e)^{-3t}u(t-1)$ ii) $x(t) = t(e)^{-2t}u(t)$	*CO4*	*PO1*	**10**
		b)	Find the DTFS of $x(n) = \cos(6\frac{\pi}{13}n + \frac{\pi}{6})$. Also plot its magnitude and phase spectra.	*CO1*	-	**06**
		c)	Find the CTFT of rectangular pulse x(t) shown below figure(8a):  figure(8a)			**04**

			UNIT - V			
	9	a)	Analyze the following signals using Z-transform technique of the and determine the ROC i) $y(n) = \left(\frac{1}{3}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(-n-1)$ ii) $y(n) = (a)^n \cos(wn)\, u(n)$	*CO5*	*PO2*	**10**
		b)	Explain the properties of ROC	*CO1*	-	**04**
		c)	Determine the discrete-time sequence x(n) which has Z-transform $X(Z) = \frac{1+5z^{-1}}{1-1.5z^{-1}+0.5z^{-2}} \qquad ROC: \lvert Z \rvert > 1$	*CO5*	*PO2*	**06**
			OR			
	10	a)	Analyze the given causal LTI system described by the difference equation $y(n) = y(n-1) + y(n-2) + x(n-1)$ i) Find the system function H(Z). ii) Plot the poles and zeros iii) Indicate the ROC.	*CO5*	*PO2*	**08**
		b)	Determine the system function and unit sample response of the system using unilateral z-transform. $y(n) - \frac{1}{2}y(n-1) = 2x(n)\,;\ y(-1) = 0$	*CO5*	*PO1*	**06**
		c)	Applying z-transforms, solve the following difference *equation* $y(n) + 3y(n-1) = x(n) \quad where\ x(n) = u(n)\,, y(-1) = 1$	*CO5*	*PO1*	**06**

****