U.S.N.										

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

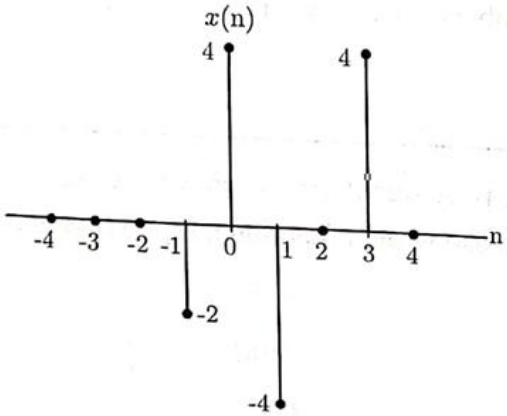
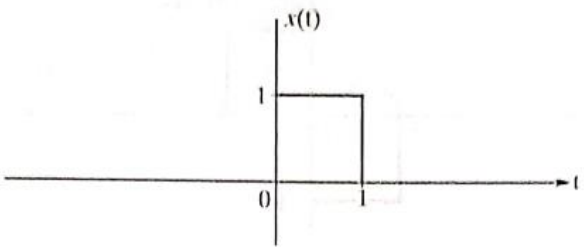
Autonomous Institute Affiliated to VTU

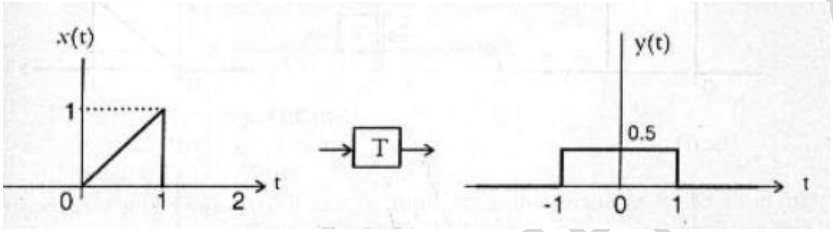
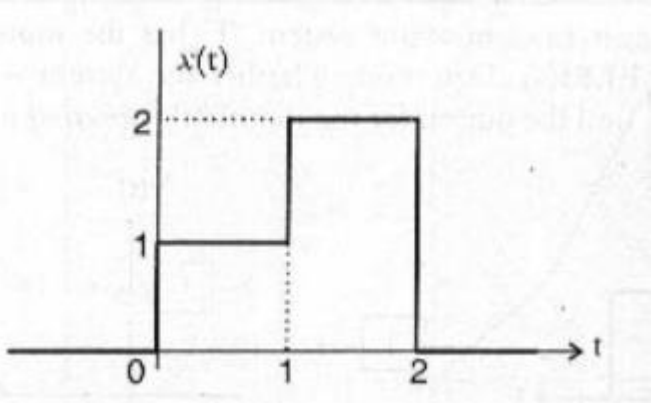
June / July 2024 Semester End Make-Up Examinations

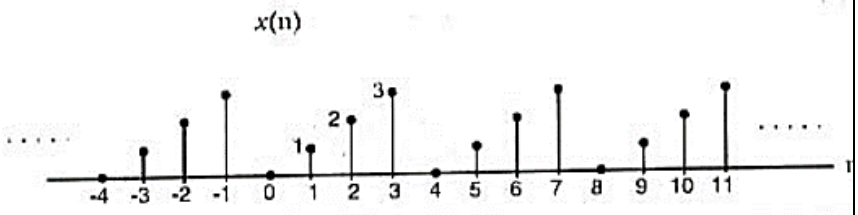
Programme: B.E. **Semester: III**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 23EC3PCSAS **Max Marks: 100**
Course: Signals and Systems

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	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)	CO 1	PO 1	08
	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)  	CO 2	PO 2	08

		c)	A periodic signal with T=10 over one is given by $x(t) = -3t\ ;\ -5 < t < 5$ Sketch the signal and determine the power	***CO 1***	***PO 1***	**04**
			UNIT - II			
	2	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) $y(n) = x(n) + nx(n+1)$	***CO 2***	***PO 2***	**08**
		b)	A system 'T' has its input-output pairs shown below where T is an integrator operator i) Determine whether the system could be memoryless and causal  ii) Determine the output for the input shown below  	***CO 2***	***PO 2***	**08**
		c)	Determine the overall operator of the following systems whose output signal is given by and also represent the block diagram $y(n) = 0.3[x(n) + x(n-1) + x(n-2)]$	***CO1***	***PO1***	**04**
			UNIT - III			
	3	a)	Obtain the total response of the system given by the following differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2x(t)$ $y(0) = 0\ ;\ \frac{dy(t)}{dt} = 1;\ for\ t = 0$ $x(t) = cost\ u(t)$	***CO 2***	***PO 2***	**08**
		b)	Sketch direct form I and direct form II implementations for the following difference equation $y(n) + 0.5y(n-1) - y(n-3) = 3x(n-1) + 2x(n-2)$	***CO 2***	***PO 2***	**04**

		c)	Evaluate the continuous –time convolution integral given below $y(t) = \{u(t+2) - u(t-1)\} * u(-t+2);$ |	***CO 2***	***PO 2***	**08**
			OR			
	4	a)	Obtain the force response described by the following difference equation $y(n) - 0.25y(n-1) - 0.125y(n-2) = x(n) + x(n-1)$ $with\ input\ x(n) = 0.125^n u(n)$	***CO 2***	***PO 2***	**08**
		b)	Sketch direct form I and direct form II implementations for the following difference equation $\frac{d^3y(t)}{dt^3} + 2\frac{dy(t)}{dt} + 3y(t) = x(t) + 3\frac{dx(t)}{dt}$	***CO 1***	***PO 1***	**04**
		c)	Evaluate the discrete-time convolution sum given below $y(n) = \{u(n+10) - 2u(n+5)) + u(n-6)\} * \beta^n u(n)\ ;\ \|\beta\| < 1$	***CO 2***	***PO 2***	**8**
			UNIT - IV			
	5	a)	Evaluate the DTFS representation for the signal x(n) as shown below and sketch the spectra. Also verify Parseval's identity 	***CO 2***	***PO 2***	**10**
		b)	Determine the DTFT of the following signal i) $x(n) = (-1)^n u(n)$ ii) $x(n) = a^{\|n\|}\ ;\|a\| < 1$	***CO 1***	***PO 1***	**05**
		c)	Evaluate the Fourier transform of the following signal. Obtain the expression for the magnitude and phase specta i) $x(t) = (e)^{-3t}u(t-1)$ ii) $x(t) = t(e)^{-2t}u(t)$	***CO 2***	***PO 2***	**05**
			UNIT - V			
	6	a)	Analyze the following signals using Z-transform technique of the and determine the ROC i) $y(n) = (a^n + a^{-n})u(n);\quad where\ a\ is\ real$ ii) $y(n) = (-1)^n 2^{-n}\, u(n)$	***CO 2***	***PO 2***	**08**
		b)	Explain the properties of ROC	-	-	**06**
		c)	Determine the discrete-time sequence x(n) which has Z-transform $X(Z) = \frac{1+5z^{-1}}{1-1.5z^{-1}+0.5z^{-2}} \qquad ROC: \|Z\| > 1$	***CO 1***	***PO 1***	**06**
			OR			

	7	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. iv) Find the unit sample response of this system.	***CO 2***	***PO 2***	**08**
		b)	Determine the unilateral z-transform for the signal $y(n) = x(n-2)\ where\ x(n) = \alpha^n$	***CO 1***	***PO 1***	**06**
		c)	Applying z-transforms, solve the following difference equation $y(n) + 3y(n-1) = x(n) \quad where\ x(n) = u(n)\ , y(-1) = 1$	***CO 2***	***PO2***	**06**

****