U.S.N.										

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

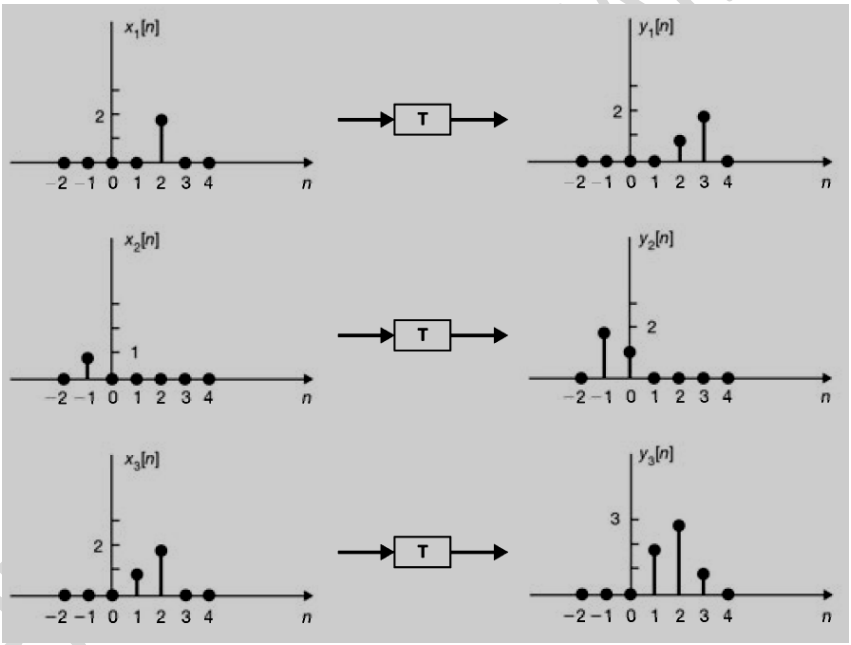
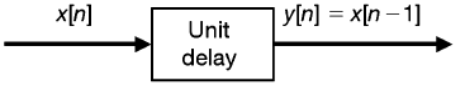
Autonomous Institute Affiliated to VTU

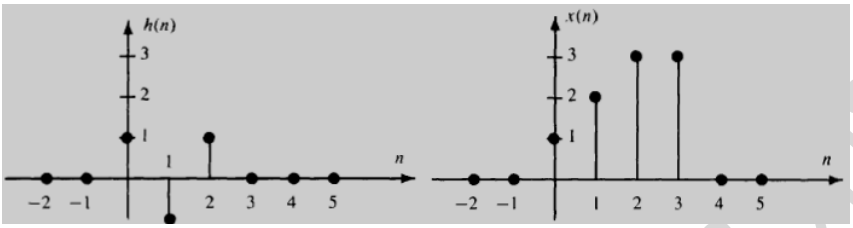
December 2023 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**
Course Code: 22ET4PCSSD **Max Marks: 100**
Course: Signal and Systems: Digital

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)	Determine whether the given system in Fig 1a is Linear  Fig 1a	*CO2*	*PO1*	**06**
	b)	For the system shown in Fig 1b determine whether the system is memoryless, causal, linear, time-invariant and stable  Fig 1b	*CO2*	*PO1*	**07**
	c)	Consider the discrete time sequence $$x(n) = \cos(n\pi/8)$$ Find two different continuous-time signals that would produce this sequence when sampled at a frequency of f_s = 10 Hz.	*CO2*	*PO1*	**07**

			UNIT - II			
	2	a)	Find the convolution of the given sequences $$x(n) = 0.5n[u(n) - u(n-6)]$$ $$h(n) = 2\sin\left(\frac{n\pi}{2}\right)[u(n+3) - u(n-4)]$$	*CO2*	*PO1*	**10**
		b)	Find the 4 point circular convolution of the given sequence in Fig 2b  Fig 2b	*CO3*	*PO2*	**10**
			UNIT - III			
	3	a)	Compute N-point DFT of (i)$x_1(n) = \alpha^n$ (ii)$x_2(n) = u(n) - u(n-n_0)$, where $0 < n_0 < N$.	*CO2*	*PO1*	**10**
		b)	Determine how a 2N-point DFT of a real-valued sequence may be computed using an N-point FFT algorithm	*CO2*	*PO1*	**10**
			UNIT - IV			
	4	a)	Consider a discrete-time system whose input x[n] and output y[n] are related by y[n] -ay[n-1] = x[n]. Find the output y[n] when x[n] = Kδ[n] and y[-1] = α	*CO2*	*PO1*	**10**
		b)	Obtain the system transfer function for the equation given $$y[n] = 1.5y[n-1] - 0.5y[n-2] + 0.5x[n]$$	*CO3*	*PO2*	**05**
		c)	For the function shown find and plot poles and zeros $$H(z) = \frac{(z-j)(z+j)}{\left(z-\left(\frac{1}{2}-\frac{1}{2j}\right)\right)\left(z-\left(\frac{1}{2}+\frac{1}{2j}\right)\right)}$$	*CO3*	*PO2*	**05**
			OR			
	5	a)	Design a lowpass filter using rectangular window of length M = 11, given $\omega_c = \pi/2$ rad/s. Find the values of h(n)	*CO3*	*PO2*	**12**
		b)	Derive expressions to design FIR filter using frequency sampling method	*CO2*	*PO1*	**08**
			UNIT - V			
	6	a)	Derive equations for filter design using Bilinear Transform	*CO2*	*PO1*	**08**

		b)	Design a digital filter equivalent of a 2nd order Butterworth low-pass filter with a cut-off frequency f_c = 100 Hz and a sampling frequency f_s = 1000 samples/sec. Derive the finite difference equation and draw the realization structure of the filter. Given $H(s) = \frac{1}{s^2+\sqrt{2}s+1}$	*CO3*	*PO2*	**12**
			OR			
	7	a)	Given the original image as 9, 7, 3, 5, 6, 10, 2, 6, find wavelet transformed image using Haar Transform	*CO2*	*PO1*	**10**
		b)	With relevant equations derive and demonstrate Direct Form 1 and 2 realizations of IIR filter	*CO2*	*PO1*	**10**

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