U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

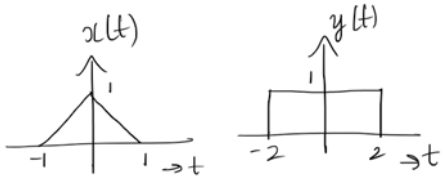
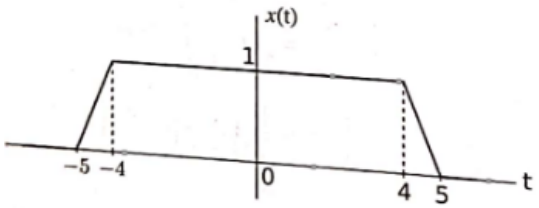
Programme: B.E. **Semester: III**

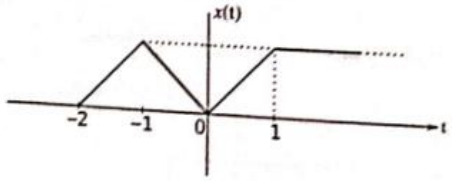
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

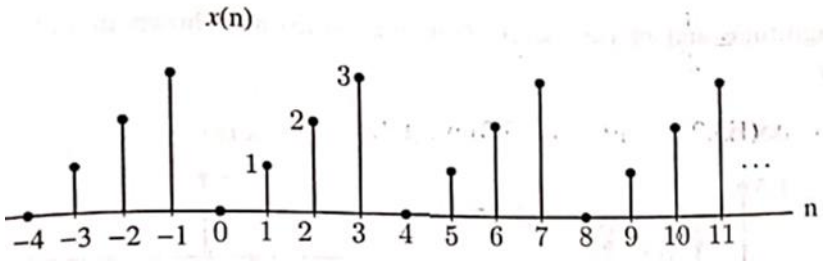
Course Code: 23EC3PCSAS / 22EC3PCSAS **Max Marks: 100**

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)	Identify whether the system is periodic or non-periodic, if periodic find the fundamental period i) x[n]= $Cos\left(\frac{\pi}{5}n\right) Sin\left(\frac{\pi}{3}n\right)$ ii) x(t) = aCos√2t+bSin(t/4)	CO1	PO1	5
	b)	Given the signal x(t) & y(t), Plot a. x(t)+y(t) b. x(t) . y(t) c. y(t)-x(t) d. y(t/2) e. x(2t-3) 	CO 1	PO 1	10
	c)	A trapezoidal pulse x(t) as shown in fig is applied to a differentiator defined by y(t)= $\frac{dx(t)}{dt}$  1. Find the resulting output y(t) of the differentiator 2. Find the energy of y(t)	CO 1	PO 1	5
		OR			
2	a)	Sketch the given signal 1. - u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3) 2. r(t+1) - r(t) + r(t-1)	CO 1	PO 1	6

		b)	Determine and sketch the even and odd parts of the signals depicted in figure.  	***CO 1***	***PO 1***	**6**
		c)	Sketch x(t) = 3 u(t+3) - u(t) + 3 u(t - 3) - 5 u(t - 6) and plot x(- 3t - 6)	***CO 1***	***PO 1***	**8**
			UNIT - II			
	3	a)	Determine whether the following systems are Memory less, Causal, Time invariant, Linear and Stable. i) y(t)= x(t/2) ii) y(n)= n x(n)	***CO2***	***PO2***	**10**
		b)	Mention the conditions on impulse response h(n) of a system to be i) memory less ii) causal iii) stable Determine whether the system given below is memoryless, causal and stable 1. h[n]=2u[n]-2u[n-1] 2. $h(t) = e^{-4\|t\|}$	***CO2***	***PO2***	**10**
			OR			
	4	a)	Define systems and classify systems into different types with example.	***CO1***	***PO1***	**10**
		b)	Determine whether the system is linear, time invariant, memory, causal and stable for the following signals. $i)\ x(t) = e^{x(t)}\quad ii) x(n) = x(-n+2)$	***CO2***	***PO2***	**10**
			UNIT - III			
	5	a)	Determine the convolution of the signals given below x(t) = u(t)-u(t-2) h(t) =t (u(t)-u(t-1))	***CO2***	***PO2***	**10**
		b)	Evaluate the total response of the LTI system described by the differential equation y''(t)+5y'(t)+6y(t)= 2 e^{-t} u(t), y(0)=0 and y'(0)=1	***CO2***	***PO2***	**10**
			OR			
	6	a)	Represent following equations in Direct form-I and Direct form-II block diagram representation. $20\frac{d^2y(t)}{dt^2} + 1\frac{dy(t)}{dt} + 23\,y(t) = x(t) + 0.7\frac{dx(t)}{dt}$	***CO2***	***PO2***	**06**

		b)	For the given LTI system, Evaluate the convolution sum using graphical method. x[n]={-1,1,0,1,-1} ; h[n]={1,2,3}. Assume that the origin of the input signal and the impulse response is at 0 and 2 respectively.	***CO2***	***PO2***	**10**
		c)	State and prove the commutative property of the convolution sum.	CO1	PO1	**04**
			UNIT - IV			
	7	a)	Find the DTFS co-efficients of the given waveform shown below. Sketch the magnitude and phase plot.  	***CO2***	***PO2***	**10**
		b)	State and prove any four properties of DTFT.	***CO1***	***PO1***	**10**
			OR			
	8	a)	State and prove any four properties of DTFS.	***CO1***	***PO1***	**10**
		b)	Evaluate the DTFS representation for the signal x(n) and sketch the Magnitude and Phase spectra of the same. $x(n) = Sin\left(\frac{4\pi}{21}n\right) + Cos\left(\frac{10\pi}{21}n\right) + 1$	***CO2***	***PO2***	**10**
			UNIT - V			
	9	a)	For the given signal, determine the Z-transform, ROC and pole zero plot. $a)\ \ x(n) = 7\left(\frac{1}{3}\right)^n u(n) - 6\left(\frac{1}{2}\right)^n u(n)$ $b)\ \ x(n) = (-a^n)u(-n-1)$ $c)\ \ x(n) = (a^n)u(n)$	***CO2***	***PO2***	**8**
		b)	Find the transform function for the LTI system described by the difference equation y[n]-5/6 y[n-1]+ 1/6 y[n-2]=x[n] if input $x[n]=2^n u[n]$.	***CO2***	***PO2***	**8**
		c)	List the properties of ROC of Z- transform.	***CO1***	***PO1***	**4**
			OR			
	10	a)	A causal LTI system is described by the difference equation y[n]=y[n-1]+y[n-2]+x[n-1] a. Find the system function H[z].	***CO2***	***PO2***	**10**

			b. Plot the poles and zeros c. Indicate the ROC. d. Find the unit impulse response of this system e. Find a stable (Non causal) unit impulse response that satisfies the difference equation			
		b)	Find the natural response of the LTI system described by the difference equation y[n]-(1/4)y[n-1]-(1/8)y[n-2]=x[n]+x[n-1] with y[-1]=0 and y[-2]=1, using Z-Transform.	***CO2***	***PO2***	**10**

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