U.S.N.										

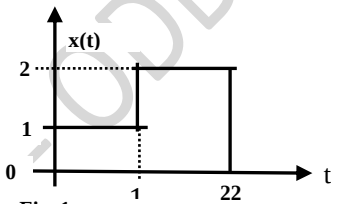
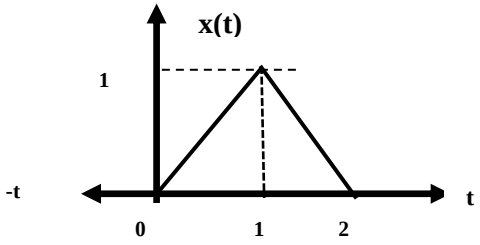
B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

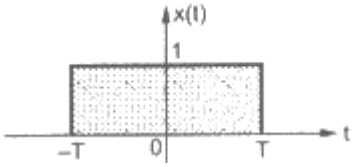
January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: ES Cluster (EEE/ET/ECE/EIE/MD) **Duration: 3 hrs.**
Course Code: 19ES4CCSAS **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)	Determine whether the following signals are periodic or not. If periodic find the fundamental period. **i)**. x(n)=cos(0.125nπ) **ii).** x(n)=(π+0.2n).	CO1	PO1	**06**
	b)	Find and sketch the even and odd components of the signal shown x(t)=u(t+1)	CO1	PO1	**06**
	c)	Sketch and label for each of the signals for the given x(t) shown: **(i).**x(2t-4)); **(ii).**x(-2t+1)  **Fig. 1**	CO1	PO1	**08**
		OR			
2	a)	Define signal? How signals are classified? Explain with examples.	CO1	PO1	**06**
	b)	List the basic operations that can be performed on a signal.	CO1	PO1	**06**
	c)	Analyse and Sketch and label for each of the signals for the given x(t) shown: **(i).**x(2t-4)); **(ii).**x(-2t+1)  **Fig.2**	CO2	PO2	**08**
		UNIT - II			
3	a)	Explain the following system of properties with an example: i). Time Invariant and time variant systems	CO1	PO1	**10**

			ii).Causal and non-causal systems			
		b)	Determine the total response for the system described by the difference equation, if input x(n)= $2^n.u(n)$ $y(n)+4y(n-1)+4y(n-2)=x(n)$ & $y(-1)=0, y(-2)=1$	*CO3*	*PO2*	**10**
			OR			
	4	a)	For each of the systems, state whether the system is linear, shift variant, stable and causal (i) y(n)= n[x(n)] (ii) $y(n)=e^{x(n)}$	*CO3*	*PO2*	**08**
		b)	Determine whether the following systems are invertible or not, if it is construct the inverse system. (i) y(t)=10 x(t) (ii) $y(t)=x^2(t)$	*CO3*	*PO2*	**06**
		c)	Implement the following LTI system in direct form-I and direct form-II block diagram representation. $\frac{d^2y(t)}{dt^2}+3\frac{dy(t)}{dt}+5y(t)=4x(t)+6\frac{dx(t)}{dt}$	*CO3*	*PO2*	**06**
			UNIT - III			
	5	a)	The impulse response of a system is given by h(t)=u(t)-u(t-2) & an input x(t)=u(t)-u(t-2). Analyse and develop the CT convolution integral of the signal.	*CO3*	*PO2*	**10**
		b)	Analyse and develop the DT convolution sum of the output signal response: **y(n); if x(n) = {1 2 3 2 } & h(n) = {1 2 2 };** and also verify results by tabular Convolution method..	*CO3*	*PO2*	**10**
			OR			
	6	a)	Consider x(n)={1,1,1,1,1} and h(n)={1,1,1,2,2,2}. Compute y(n)=x(n)*h(n)\ using tabular Column method	*CO3*	*PO2*	**06**
		b)	Fine the total response of the system described by the equation $4y(n)+4y(n+1)+y(n+2)=x(n)$ with an input $x(n)=4^n u(n)$. Initial condition being y(-1)=0,y(-2)=1.	*CO3*	*PO2*	**08**
		c)	A difference equation of discrete time system is given below: $y(n)-0.2y(n-1)+0.6y(n-2)=x(n)+0.4x(n-1)$. Draw direct form-I and direct form-II structure.	*CO1*	*PO1*	**06**
			UNIT - IV			
	7	a)	Obtain the frequency response and the impulse response of the system having the output y(n) for the input x(n) as given below $x(n)=0.5^n.u(n);\ y(n)=\frac{1}{4}(0.5)^n.u(n)+(0.25)^n.u(n)$	*CO 3*	*PO2*	**10**

		b)	State the following DTFT properties a) Convolution Property. b) Parseval's Theorem. c) Frequency Shifting property.	*CO1*	*PO1*	**10**
			OR			
	8	a)	Find the FT of rectangular pulse shown below in Fig.4. and plot its magnitude and phase spectrum.  **Fig.4**	*CO3*	*PO2*	**10**
		b)	The input and the output of a causal LTI system are related by differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$. i) Find the impulse response of this system ii) What is the response of this system if x(t) = $te^{-2t}u(t)$	*CO3*	*PO2*	**10**
			UNIT - V			
	9	a)	State the properties of ROC.	*CO1*	-	**04**
		b)	Solve the following difference equation using unilateral Z-transform. $y(n) - 1.5\,y(n-1) + 0.5\,y(n-2) = x(n)\ for\ n \geq 0$ With initial conditions $y(-1) = 4,\ y(-2) = 10\ \ and$ $x(n) = (0.25)^n.u(n)$	*CO3*	*PO2*	**10**
		c)	The input and output of an LTI system is given by $x(n) = u(n);\quad y(n) = (0.5)^{n-1}.u(n+1)$ Find the Transfer Function.	*CO2*	*PO1*	**06**
			OR			
	10	a)	Solve the following difference equation using unilateral Z-transform. $y(n) - \frac{3}{2}y(n-1) + \frac{1}{2}y(n-2) = x(n)$; for n≥0 With initial conditions y(-1)=4; y(-2)=10 and $x(n) = \left(\frac{1}{4}\right)^n u(n)$	*CO3*	*PO2*	**10**
		b)	Find the Z-transform of $x(n) = a^n u(n) + b^n u(-n-1)$	*CO3*	*PO2*	**05**
		c)	Find the inverse Z-transform of $X(z) = \frac{z^2 - 3z}{z^2 + \frac{3}{2}z - 1}$	*CO3*	*PO2*	**05**

****