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: III**

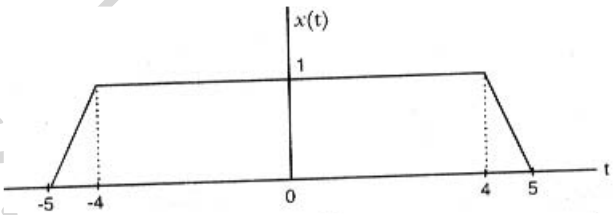
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

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.

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)	Distinguish between i) Continuous and Discrete Time signal ii) Even and Odd Signal iii) Energy and Power Signal	CO 1	PO 1	6
	b)	Consider the sequence $x[n]=\begin{cases} n & 0\le n\le 2 \\ n-2 & 3\le n\le 5 \\ 0 & otherwise \end{cases}$. Sketch the following signals i) y[n]=x[2n] u[n-2] ii) y[n]=x[-3n] u[-n]	CO 1	PO 1	8
	c)	Determine the energy of the signal shown in fig 1.c  Fig 1.c	CO 1	PO 1	6
		OR			
2	a)	Determine whether the following signals are periodic or not. If periodic find its fundamental period i) $x(t)=10\cos(\pi t)\sin(4\pi t)$ ii) $x(t)=\cos(\frac{\pi}{4}t+\frac{\pi}{2})+\cos(\sqrt{2}t)$	CO 1	PO 1	8
	b)	Sketch the even & odd parts of the following signals i) x(t)=u(t)-u(t-4) ii) $x[n]=(0.8)^n u[n]$	CO 1	PO 1	6
	c)	A periodic signal with period T=10 over one cycle is given by x(t)= -3t; -5<t<5. Sketch x(t) and find its power.	CO 1	PO 1	6

			UNIT - II			
	3	a)	Discuss the properties of system with example.	***CO 1***	***PO 1***	**10**
		b)	Check whether the following system is i) BIBO stable, ii) linear, iii) time invariant, iv) causal v) memoryless i) y[n]=$\log_{10}$(|x[n]|) ii) $y(t)=\frac{dx(t)}{dt}$	***CO 2***	***PO 2***	**10**
			OR			
	4	a)	Check whether the following system is i) BIBO stable, ii) linear, iii) time invariant, iv) causal v) memory less i) y[n]=g[n]x[n] ii) y[n]=nx[n]	***CO 2***	***PO 2***	**10**
		b)	Determine a continuous time LTI system characterized by impulse response $h(t)=e^{2t}u(t-1)$ is i) stable ii) causal iii) memoryless iv) linear and v) invertible	***CO 2***	***PO 2***	**10**
			UNIT - III			
	5	a)	Evaluate y[n]= x[n] * h[n] ; where x[n]= α^n u[n] ; |α| <1 and h[n]= β^n u[n] ; |β| <1	***CO 2***	***PO 2***	**10**
		b)	Consider an LTI system having an impulse response $h(t)=e^{-t}u(t)$ and input $x(t)=e^{-3t}\{u(t)-u(t-2)\}$. Find the output of an LTI system.	***CO 2***	***PO 2***	**10**
			OR			
	6	a)	Determine the convolution of the signals below x(t) = u(t)-u(t-2) h(t) =t (u(t)-u(t-1))	***CO 2***	***PO 2***	**10**
		b)	Find the total response for the system described by the following difference equation $y(n)-\frac{1}{9}y(n-2)=x(n-1)$ with y(-1)=1 and y(-2)=0 and x(n)=u(n)	***CO 2***	***PO 2***	**10**
			UNIT - IV			
	7	a)	State and prove the following properties of discrete time Fourier series i) Time shift ii) frequency shift	***CO 1***	***PO 1***	**6**
		b)	Determine the DTFS of the signal $x(n)=\cos\left(\frac{\pi}{3}n\right)$ and draw the spectrum.	***CO 2***	***PO 2***	**7**
		c)	Find the DTFT of the signal $x(n)=\alpha^n\sin(\Omega_0 n)u(n)$; |α|<1.	***CO 2***	***PO 2***	**7**
			OR			
	8	a)	Compute the inverse Fourier transform of the signal $X(j\omega)=\frac{-j\omega}{2+3j\omega+(j\omega)^2}$	***CO 2***	***PO 2***	**6**

		b)	State and prove any four properties of DTFT.	***CO 1***	***PO 1***	**8**
		c)	Obtain the frequency response and the impulse response of the system described by the difference equation $y(n)+\frac{1}{2}y(n-1)=x(n)-2x(n-1)$	***CO 2***	***PO 2***	**6**
			UNIT - V			
	9	a)	Determine the impulse response h(n) and transfer function H(Z) of an LTI system with input $x(n)=\left(\frac{1}{2}\right)^n u(n)-\frac{1}{4}\left(\frac{1}{2}\right)^{n-1}u(n-1)$ and output $y(n)=\left(\frac{1}{3}\right)^n u(n)$	***CO 2***	***PO 2***	**10**
		b)	A Causal LTI system is described by the difference equation $y(n)=y(n-1)+y(n-2)+x(n-1)$. Find the system function H(Z) and impulse response. Plot the poles and zeros and indicate ROC.	***CO 2***	***PO 2***	**10**
			OR			
	10	a)	A LTI discrete time system is given by the system function $H(z)=\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$ Specify the ROC of H(Z) and find h(n) (i) for stable system. (ii) for causal system	***CO 2***	***PO 2***	**10**
		b)	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 $x(n)=(1/4)^n u(n)$	***CO 2***	***PO2***	**10**

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