U.S.N.										

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

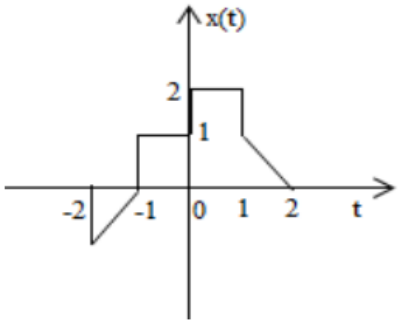
Autonomous Institute Affiliated to VTU

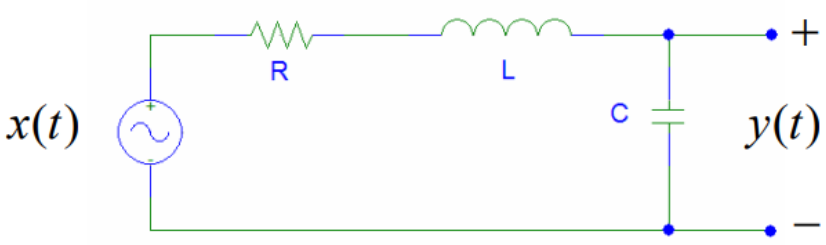
April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**
Course Code: 23ET3PCSSA **Max Marks: 100**
Course: Signals and Systems: Analog

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)		Define the following with examples. (i) Even and odd Signals (ii) Energy and power Signals	*CO1*	-	**04**
	b)		A continuous-time signal x(t) is shown in fig. sketch and label carefully each of the following signals: i) x(t-1) ii) x(2-t) iii)x(t)[δ(t+3/2) - δ(t-3/2)] iv) x(2t+1) 	*CO2*	*PO1*	**08**
	c)		Justify whether the following system are linear or nonlinear, time invariant or not, causal or noncausal, stable or unstable. (i) y(*t*) = tx(t) (ii) y(t) = x(t) u(t).	*CO3*	*PO2*	**08**
			UNIT – II			
2	a)		List the basic properties of continuous integral with example.	*CO2*	*PO1*	**04**
	b)		Consider two continuous signals $x(t)= e^{-3t}[u(t)-u(t-2)]$ and $h(t)= e^{-t} u(t)$; (i) Evaluate y(t) using convolution integral (ii) Check for causality of h(t).	*CO2*	*PO1*	**08**
	c)		The impulse response of a continuous time LTI system is given by $h(t)= e^{2t} u(t-1)$. Is system is causal and stable?. Comment on your answer.	*CO2*	*PO2*	**08**

			OR			
	3	a)	List the difference between auto-correlation and cross-correlation.	*CO2*	*PO1*	**04**
		b)	Perform the convolution operation of the following signals $x1(t)=e^{-\|t-2\|}$ and $x2(t)= e^{-2t}\,u(t+4)$	*CO2*	*PO1*	**08**
		c)	The input x(t) and impulse response h(t) of a continuous-time LTI system are defined as x(t)=u(t) and $h(t)=e^{-at}u(t)$. Compute the output y(t).	*CO2*	*PO2*	**08**
			UNIT - III			
	4	a)	List the steps involved in deriving the Fourier Transform from Fourier series.	*CO1*	-	**05**
		b)	(i) State and prove Parseval's Theorem with reference to continuous time signal. (ii) Find the Fourier Transform of the following signal and draw its frequency spectrum $x(t)=\begin{cases}10 & -5\le t\le 5\\ 0 & otherwise\end{cases}$	*CO3*	*PO2*	**10**
		c)	Using convolution property of Fourier Transform, prove that output of the LTI system for sinusoidal input is sinusoidal.	*CO3*	*PO2*	**05**
			OR			
	5	a)	Write about energy spectral density and power spectral density.	*CO1*	-	**05**
		b)	Obtain the Fourier transforms and spectrums of following signals (i) $x(t)=\cos(w_0t)$ (ii) $x(t) =e^{-a\|t\|}$	*CO3*	*PO2*	**10**
		c)	Find Power spectral density of unit step function.	*CO3*	*PO2*	**05**
			UNIT – IV			
	6	a)	Draw pole zero plot for the Transfer function. $H(s)=\dfrac{2s^2+12s+20}{s^3+6s^2+10s+8}$ What will happen if the pole moves closer to the j ω axis ?	*CO3*	*PO2*	**05**
		b)	Find Transfer function of 	*CO3*	*PO2*	**07**
		c)	Determine the zero-input response for the system described by the differential equation: $d^2y(t)/dt^2+ 3\,dy(t)/dt+2y(t)= x(t)+ dx(t)/dt;\ y(0)= 0\ ;\ y'(0)=1$	*CO3*	*PO2*	**08**

			UNIT – V			
	7	a)	List any two properties of Butterworth filter.	*CO4*	*PO1*	**04**
		b)	Explain practical implementation of first order Butterworth Low pass filter.	*CO4*	*PO2*	**08**
		c)	Obtain the order of the Butterworth filter that has an attenuation of 1dB at 2 KHz and at least 40 dB at 16 KHz.	*CO4*	*PO3*	**08**

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