DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Summer Examination – 2023

Course: B. Tech. Branch : E&TC/ ECE / Electronics Engineering

Subject Code & Name: Signal & System (BTETC402/BTEXC402) Semester : IV

Max Marks: 60 Date:15/07/2023 Duration: 3 Hr.

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Sketch the following signal	**CO 01**	**6**
	i) x(t)= 3*r(t)-3*u(t-3)		
	ii) $x[n] = \delta[n] + \frac{1}{2}\delta[n-1] + (\frac{1}{2})^2\delta[n-2] + (\frac{1}{2})^3\delta[n-3]$		
B)	Derive the expression for relationship between input and output of LTI system in time domain	**CO 02**	**6**
C)	Determine if the following systems are time-invariant, linear, causal	**CO 01**	**6**
	i) **Y(t)= t*(X(t))**		
	ii) **Y[n]= X[n]+ n*X[n+1]**		
Q.2	**Solve Any Two of the following.**		**12**
A)	Explain the Even and odd signal with example. Also show that sum of even part and odd part of signal is equal to original signal.	**CO 01**	**6**
B)	Prove the following statements : i) The convolution of an odd and even function is odd. ii) The convolution of an even and even function is even. iii) The convolution of an odd and odd function is odd.	**CO 02**	**6**
C)	Find the Fourier series coefficients C_k for the signal **x(t) = (1/2)+(1/3)*cos(t)+(1/2)*cos(2t)** Also find the FSC of following i)X(-t) ii) X(t/2) iii) x(t-2)	**CO 03,04**	**6**
Q. 3	**Solve Any Two of the following.**		**12**
A)	Let $x(n)$ = **δ(n+2)- δ(n+1)+2*δ(n)+ δ(n-1)- δ(n-2)** with discrete time Fourier transform $X(e^{jw})$. Evaluate the following functions of $X(e^{jw})$ without computing the transform itself: (i) $X(e^{j0})$ (ii) $X(e^{j\pi})$ (iii) $\int_{-\pi}^{\pi} X(e^{jw})\,dw$ (iv) $X(e^{jw})$ (v) Magnitude and phase of $X(e^{jw})$	**CO 03**	**6**

B)	If $X(e^{jw})$ is the Fourier Transform of a real sequence $x[n]$ then, show the following: (i) $X(e^{jw})$ is conjugate symmetric (ii) phase of $X(e^{jw})$ is anti-symmetric and Phase Spectrum is odd function (iii) magnitude of $X(e^{jw})$ is symmetric and Magnitude Spectrum is even function	**CO 03**	**6**
C)	Find Laplace transform of function: $\mathbf{f(t) = 4t^2 - 3Cos\ t + 5e^{-t}}$ with $0 \leq t < \infty$:	**CO 04**	**6**

Q.4 Solve Any Two of the following. **12**

A)	Perform the inverse Laplace transform of the following expression: $\mathbf{F(s) = (3s + 7) / (s^2 - 2s - 3)}$	**CO 04**	**6**
B)	Determine the z transform and ROC for the signal $\mathbf{x[n]= [3(2^n) - 4(3^n)].u(n)}$	**CO 04**	
C)	Find Fourier transform of signal $\mathbf{x(t) = e^{at}.u(-t)}$ Also draw Amplitude and Phase Spectrum .	**CO 03**	**6**

Q. 5 Solve Any Two of the following. **12**

A)	Prove that energy in Continuous Domain and Energy in Fourier Domain remains Unchanged	**CO 03**	**6**
B)	Compute the inverse z-transform of signal $\mathbf{x(z) = (z+2) /(2z^2-7z+3)}$ if ROCs are i) IzI >3 ii) IzI < ½ iii) ½ < IzI < 3	**CO 04**	**6**
C)	Determine the DTFS of x[n]={1,2,1,0}with period N=4.	**CO 03,04**	**6**

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