DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular End Semester Examination – Summer 2022

Course: B. Tech. Branch : Electronics and Telecomm. Engg. Semester :IV

Subject Code & Name: BTETC402 Signals & Systems

Max Marks: 60 Date: 18/08/2022 Duration: 3.45 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.**		
A)	Find even and odd parts of $x(n) = u(n)$ and plot them.	1	6
B)	i) Find that the following system is linear or not	1	6
	$y(t) = t.x(t)$		
	ii) Find that the following system is causal or not:		
	$y(n) = x(-n)$		
C)	i) Determine the Nyquist rate for the following signals	1	3
	1) $x(t) = \sin(200\pi t)$		
	2) $x(t) = \sin^2(200\pi t)$		
	ii) Determine whether $u(t)$ is a power signal or energy signal by finding out the power and energy of the signal	1	3
Q.2	**Solve Any Two of the following.**		
A)	Derive the formula for convolution sum for discrete time LTI systems.	1	6
B)	i) Compute the following convolution sum $y(n) = x(n)* h(n)$	1	6
	$x(n) = h(n) = u(n)$		
	ii) Compute the following convolution sum $y(n) = x(n)* h(n)$ with the tabular method of convolution sum.		
	$x(n) = \{1, 1, 2, 3\}$, n=0 to 3		
	$h(n) = \{1, 1, 1\}$, n=0 to 2		
C)	Solve and sketch the following Convolution integral.	1	6
	$x(t) = 1$ for $-1 < t < 1$		
	$= 0$ otherwise		
	$h(t) = \delta(t+1) + 2\delta(t+2)$		

Q. 3 Solve Any Two of the following.

A) Find the trigonometric Fourier Series for the following signal   2   6

$$x(t) = 10t/2\pi \quad , \quad 0 < t < 2\pi$$

B) 1) State the Dirichlet conditions for the existence of Fourier series.   2   6

2) Derive the formula for Trigonometric Fourier Series for the

waveforms with even symmetry.

C) Derive the relationship between Trigonometric and Exponential   2   6

Fourier Series. i.e. derive the formula of Exponential Fourier Series

starting from the formula of Trigonometric Fourier Series.

Q.4 Solve Any Two of the following.

A) State and prove the following properties of CTFT: 3   6
1. linearity
2. time shifting
3. time reversal
4. frequency shifting
5. differentiation in time domain

B) Find DTFT of $x(n) = a^n u(-n-1)$ for $|a| > 1$. Also find its magnitude and   3   6
phase.

C) Find the system frequency response $H(e^{jw})$ for   3   6
$h(n) = 0.5\delta(n) + \delta(n-1) + 0.5\delta(n-2)$
Also plot magnitude and phase response.

Q. 5 Solve Any Two of the following.

A) State the properties of ROC of Z transform.   4   6

B) For the following system functions, check whether the corresponding   4   6
LTI system is causal, anticausal, or non-causal by finding the inverse Z-
Transform in each case.
$$H(z) = \frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}} \quad |z| > 3$$

C) Find the Inverse Laplace transform of   4   6

$$.H(z) = \frac{-3}{(s+2)(s+2)} \quad \text{for } -2 < R\{s\} < 1$$

*** End ***