Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

UG - (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

BE – ELECTRONICS AND COMMUNICATION ENGINEERING

V Semester

EC5304 & SIGNALS AND SYSTEMS

(Regulation 2019)

Time: 3hrs Max.Marks: 100

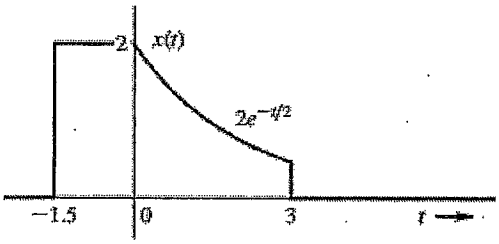
CO 1	Ability to clarify signals and systems based on various characteristics and decomposition for easier analysis
CO 2	Ability to determine and analyze frequency components of signals and frequency response of the systems
CO 3	Ability to determine and analyze the capability and stability LTI systems for their impulse response
CO 4	Ability to convert the CT signals into DT signals and analyze, the effect of sampling and frequency content of DT signals
CO 5	Ability to analyze LTI systems and realize with various structures

BL – Bloom's Taxonomy Levels

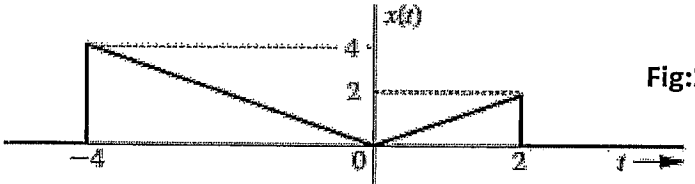
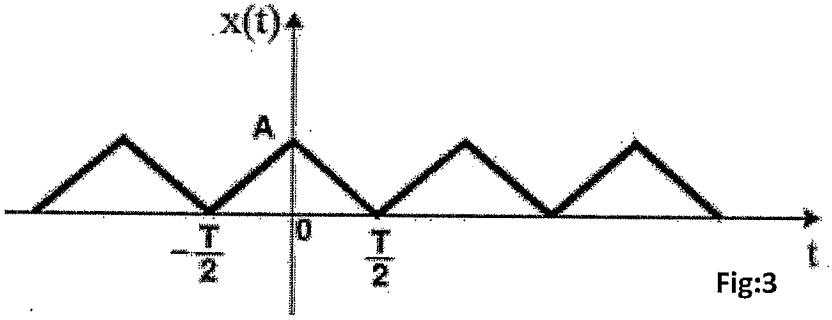
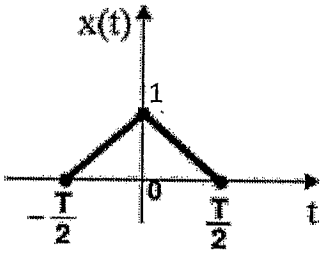
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Draw the time reversal signal x(-t) for the following signal x(t) as shown in Fig:1?  Fig:1	2	1	L3
2	Determine whether the corresponding system y[n] = x[n-2] +x[n]+x[n+2] is time variant / invariant ?	2	1	L3
3	Find the Fourier series coefficients of the following signal x(t)? $x(t) = 5 + \sin(10\frac{\pi}{7}t)$?	2	2	L4
4	Determine the Laplace transform of the signal x(t) = sin(ωt)u(t)?	2	2	L2
5	Find the transfer function of the system described by $3y(t) + 4\frac{dy}{dt} = 2x(t)$?	2	3	L2
6	Give any two properties of convolution integral?	2	3	L1
7	Determine the Nyquist rate and sampling frequency of given signal $x(t) = \cos^2(200\pi t)$?	2	4	L3
8	Find the DTFT of the following discrete time signal: x[n] = δ [n-3] + δ [n+3]?	2	4	L4
9	Draw the basic building blocks representation of multiplier and adder for discrete time systems?	2	5	L1
10	Determine the system function H(z) for the given difference equation y[n] – 0.5 y[n-1] + 0.25 y[n-2]=x[n]?	2	5	L3

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a)	The input signal x(t) is for the given signal x(t) in Fig:2. (i) Find the equation for the x(t) and determine & sketch the $\frac{d^2x}{dt^2}$ (ii) For the signal x(t), sketch x(t-4), $X(\frac{t}{1.5})$, x(2t-4) and x(2 -4).  Fig:2	13	1	L4
	OR			
11 (b)	Classify the systems S_1 and S_2 described by the input x(t), x[n] – output y(t), y[n]; relations based on linearity, time invariance, static, causality, recursive, invertability and stability: (i) S_1: y(t) = sin(2t) x(t) (ii) S_2: y[n] = x[3n + 1]	7 6	1	L4
12 (a)	Find the Fourier series for the periodic triangular signal x(t) illustrated in the following Fig:3, and sketch the amplitude and phase spectra for x(t)s?  Fig:3	13	2	L2
	OR			
12 (b)	(i) Using the time-differentiation and time shifting properties, find the Fourier transform of the triangular pulse $\Delta(\frac{t}{T})$ as shown in Fig:4?  Fig:4 (ii) Using the time shifting property, find the Laplace transform of f(t) = (t-1) [u(t-1) – u(t-2)] + [u(t-2) – u(t-4)]?	7 6	2	L2
13 (a)	(i) Solve the second-order linear differential equation $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y(t) = \frac{dx}{dt} + x(t)$. If the initial conditions are $y(0^-) = 2$, $\dot{y}(0^-) = 1$ and the input x(t) = e^{-4t} u(t)?	7	3	L3

●	(ii) Realize the transfer function H(s) = $\frac{4s+28}{s^2+6s+25}$ by canonic direct (direct form II) and parallel form?	6		
	OR			
13 (b)	Determine the convolution of the following signal x(t) = e^{-3t} u(t) and h(t) = u(t-1)?	13	3	L3
14 (a)	Briefly explain about baseband sampling of Continuous Time signals with and without aliasing?	13	4	L2
	OR			
14 (b)	(i) Determine and illustrate the Discrete Time Fourier Transform of the sequence x[n] = $\frac{1}{4}$ sinc($\frac{1}{4}$ [n − 2])?	7	4	L2
	(ii) Find the initial and final value theorem of z-transform for the given function x(z) = $\frac{1}{1+2z^{-1}-3z^{-2}}$?	6		
15 (a)	(i) Determine the transfer function and impulse response for the causal LTI system described by the difference equation y[n] – 0.5 y[n – 1]=x[n] +2x [n-1]?	7	5	L4
	(ii) Check whether the corresponding LTI system with system function H[z]= $\frac{-1-0.4z^{-1}}{1-2.8z^{-1}+1.6z^{-2}}$ is stable and causal, if the ROC is |z| >2?	6		
	OR			
15(b)	(i) Find the inverse z-transform of the following function H[z] = $\frac{z(2z-1)}{(z-1)(z+0.5)}$	7	5	L4
	(ii) Calculate the convolution of two signal x[n] = {1, 2, 1, 2} and h[n] = {1, 1, 1, 1}?	6		

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Find the response y(t) of an LTI system with the transfer function H(s) = $\frac{1}{s+5}$ R{s} >-5, and the input x(t) = $e^{-t}u(t) + e^{-2t}$u(-t).	15	3	L5