Reg. No.													

Question Paper Code	11706

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Electronics and Communication Engineering

(Common to Computer and Communication Engineering)

20ECPC303 - SIGNALS AND SYSTEMS

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

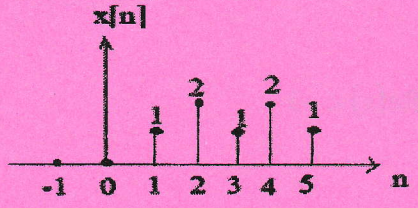
Answer ALL Questions

		Marks, K-Level,CO
1.	Draw the signal x[n] = u[n] − $u[n-5]$.	2,K1,CO1
2.	Identify whether the given system described by the equation is linear or not. $y(n) = nx(n)$.	2,K2,CO1
3.	What are Dirichlet's conditions for existence of Fourier Series?	2,K2,CO2
4.	Solve for the complex Fourier series representation of $x(t)$= sin ω_0 t.	2,K2,CO2
5.	Find the ROC and Laplace transform of $x(t) = u(t)$.	2,K2,CO3
6.	Using Fourier transform property, determine the Fourier transform of x(t) = x(4t – 8).	2,K2,CO3
7.	Find the poles and zeros for $H(s) = \dfrac{s(s+5)}{(s+2)(s+3)(s+4)}$	2,K1,CO4
8.	Find the system function for the given differential equation $\dfrac{dy(t)}{dt} + 2y(t) = x(t) + \dfrac{dx(t)}{dt}$.	2,K2,CO4
9.	Find the convolution sum for the given sequence x(n)={1,4,3,2};h(n)={1,3,2,1}.	2,K1,CO6
10.	Consider an LTI system given by the difference equation y(n)+3/4y(n-1)+1/8y(n-2) =x(n). Find the unit sample response.	2,K1,CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A discrete time signal x[n] is shown below.	13,K2,CO1



Sketch and label carefully each of the following signals.

(i) $x[n-2]$

(ii) $x[n+1]$

(iii) $x[-n]$

(iv) $x[-n+1]$

(v) $x[2n]$

(vi) $x[-2n+1]$

OR

b) The input-output relation of a system is given by *13,K2,CO1*

$$\frac{d^2y(t)}{dt^2} + 3t\frac{dy(t)}{dt} + y(t) = x(t)$$

Identify whether the full wave rectifier is

(a) Linear`

(b) Time-invariant

(c) Stable

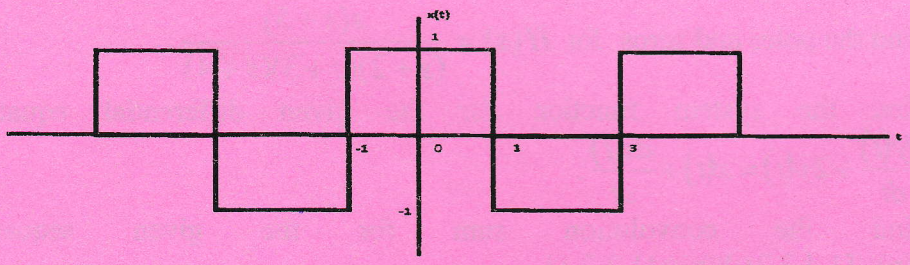
(d) Memory less

(e) Causal

12. a) Examine the trigonometric Fourier series over the interval (-1, 1) for the signal $x(t) = t^2$. *13,K2,CO2*

OR

b) Calculate the trigonometric Fourier Series for the periodic signal shown in figure. *13,K2,CO2*



13. a) Compute the Fourier transform for the following signals $x(t)=e^{-at}u(t)$ and plot the Fourier spectrum. *13,K2,CO3*

OR

b) Determine the signal $x(t)$, for each of the following Laplace transforms and their associated Regions Of Convergence *13,K2,CO3*

(a) $X(s)=\frac{s}{s^2+9}, \mathrm{Re}(s)>0$

(b) $X(s)=\frac{s+2}{s^2+7s+12}, -4<\mathrm{Re}(s)<-3$

14. a) (i) Using Laplace transform, find the impulse response of an LTI system described by the differential equation $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$. *7,K2,CO4*

(ii) Draw the direct form I and II implementation of the system described by $\frac{dy(t)}{dt} + 5y(t) = 3x(t)$ *6,K2,CO4*

OR

b) The impulse response of an LTI system is $h(t)=2e^{-3t}u(t)$. Find the response of the system for the input $x(t)=2e^{-5t}u(t)$ using Fourier Transform. *13,K2,CO4*

15. a) Using Z- Transform, Identify system transfer function and impulse response of discrete time system described by the difference equation $y(n)-5/6\ y(n-1)+1/6y(n-2)=x(n)-1/2x(n-1)$. *13,K3,CO6*

OR

b) Calculate convolution for the given sequence using graphical method for the sequence $x(n)=\{1,4,3,2\}$ $h(n)=\{1,3,2,1\}$. *13,K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) (i) State and prove sampling theorem for a band limited signal. *8,K2,CO5*

(ii) Given signal $x(t) = 5\cos(2000\pi t)+10\cos(1000\ \pi t)+20\cos(10000\ \pi t)$ Determine (a) Minimum sampling rate to avoid aliasing
(b) Discrete time signal if sampling rate fs=16 kHz
(c) Discrete time signal if sampling rate fs=8 kHz *7,K2,CO5*

OR

b) Find the inverse Z-transform of

(a) $X(z) = \frac{1-\frac{1}{2}z^{-1}}{1+\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}, |z| > \frac{1}{2}$ *8,K2,CO5*

(b) $X(z) = \frac{1-\frac{1}{2}z^{-1}}{1-\frac{1}{4}z^{-2}}, \quad |z| > \frac{1}{2}$ *7,K2,CO5*