

Reg. No.

Question Paper Code

12062

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

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

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. Find whether the given system is $y(n)=n x(n)$ is causal or not. | 2,K2,CO1 |
| 2. Define a linear system. | 2,K1,CO1 |
| 3. State Dirchlet's condition of Fourier Transform. | 2,K1,CO2 |
| 4. State initial value theorem of Laplace Transform. | 2,K1,CO2 |
| 5. Give the expression for convolution integral. | 2,K2,CO3 |
| 6. Find Laplace transform of $x(t)=-e^{-at}u(-t)$. | 2,K2,CO3 |
| 7. Write the relationship between DTFT and Z-transform. | 2,K2,CO4 |
| 8. Find Z-transform of $n x(n)$. | 2,K2,CO4 |
| 9. Convolve the following signals $x(n)=\{1,2,3\}$ $h(n)=\{1,2\}$. | 2,K2,CO5 |
| 10. Determine whether the following system is recursive system and justify your answer $y(n) = 2x(n) + 3x(n-1) - 2x(n-2)$. | 2,K2,CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) (i) Find out whether the following signals are periodic or not. If periodic find the period.
- a. $x(t)=2 \cos(10t+1)- \sin(4t-1)$.
- b. $x(n)=\cos(0.1\pi n)$.
- (ii) Find out whether the following signals are energy or power signal or neither power nor energy. Determine power or energy as the case may be for the signal $x(t)=u(t)+5u(t-1)-2u(t-2)$.
- OR**
- b) A continuous time system has the input-output relation given by $y(t)=t x(t-1)$. Determine whether the system is
- (i) Linear
- (ii) Time-invariant

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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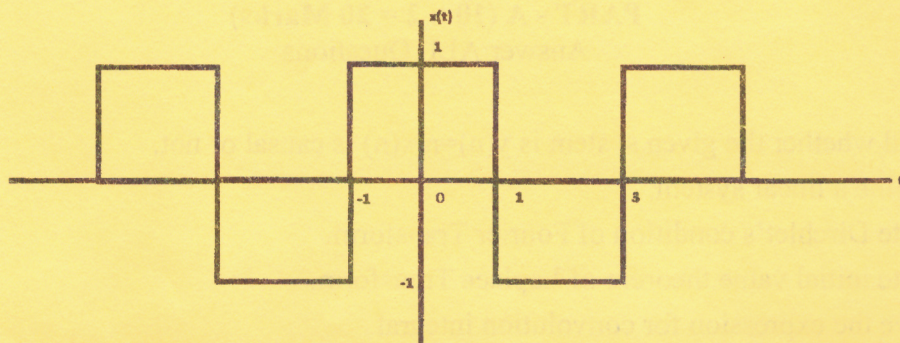
- (iii) Stable
- (iv) Memoryless
- (v) Causal

12. a) Find the Fourier series coefficients for the continuous time Periodic Signal. 13,K2,CO2

$$x(t) = \begin{cases} 1.5, & 0 \leq t \leq 1 \\ 1, & 1 \leq t \leq 2 \end{cases}$$

OR

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



13. a) Find the Fourier transform of each of the following signals and sketch the magnitude and phases a function of frequency, including both positive and negative frequencies. 13,K3,CO3

- (i) $\delta(t-5)$
- (ii) $e^{-at} u(t)$ where a - real & positive.

OR

- b) (i) Find the Laplace transform of $x(t) = te^{-at}u(t)$ 6,K3,CO3
 (ii) Find the inverse Laplace transform of $X(s) = \frac{2s^2 + 5s + 5}{(s+1)^2(s+2)}$ 7,K3,CO4

14. a) State and prove the following properties of DTFT. 13,K2,CO4

- (i) Linearity
- (ii) Time Shifting
- (iii) Frequency shifting
- (iv) Time reversal

OR

- b) Find the Z-transform and associated ROC for each of the following sequences. 13,K3,CO4

- (i) $x(n) = \delta(n-n_0)$
- (ii) $x(n) = u(n-n_0)$

15. a) Consider the system:

13,K3,CO5

$$H(z) = \frac{0.2z}{(z+0.4)(z-0.2)}; \text{ROC}; |z| > 0.4$$

- Find the impulse response function of the system
- Is DTFT exists for the system? if so, how?
- Find the DTFT.

OR

b) (i) Consider the signal :

7,K3,CO5

$$x(n) = \begin{cases} \left(\frac{1}{3}\right)^n \cos\left(\frac{\pi}{4}n\right), & n \leq 0 \\ 0, & n > 0 \end{cases}$$

Determine the poles and ROC for X(z).

6,K3,CO5

(ii) Find inverse Z-transform of $X(z) = \frac{1-z^{-1}}{1-z^{-2}}, |z| > \frac{1}{2}$

PART - C (1 × 15 = 15 Marks)

16. a) Obtain the cascade form realization of the system described by the difference equation.

15,K3,CO6

$$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + 3x(n-1) + 2x(n-2)$$

OR

b) Convolve the following signal:-

15,K3,CO6

$$X(n) = u(n) - u(n-3).$$

$$H(n) = (0.5)^n u(n).$$