Sr. No.....00350/.....

December 2023

B. Tech. (CE / CE ~~(Hindi Medium)~~ / CSE / IT) 5th Sem.

Signals & Systems (~~ESC-501-/~~ PEC - IT - I - 501)

Time: 3 Hours **Max. Marks:75**

Instructions: *1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART -A

Q1 (a) List various Signal Properties. (1.5)

(b) Define Causality and Realisability. (1.5)

(c) List Properties of State Transition Matrix. (1.5)

(d) Give two examples of LTI Systems and prove them as LTI Systems. (1.5)

(e) What is Fourier Domain Duality? (1.5)

(f) List advantages and limitations of z - Transform. (1.5)

(g) Define Parseval's Theorem. (1.5)

(h) Briefly explain Nyquist–Shannon sampling theorem. (1.5)

(i) Explain Aliasing. (1.5)

(j) With the help of Block Diagrams, give two examples of Feedback Control Systems. (1.5)

PART -B

Q2 (a) Find the z - Transform of the sequence, $y(n) = x(n+3)\, u(n)$. (10)

(b) Discuss various Properties of the FIR filters and IIR Filters. (5)

Q3 (a) Explain Zero - Order Hold and First - Order Hold devices. (5)

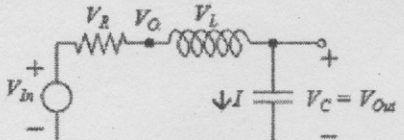
(b) State and Prove Signals Sampling Theorem. (10)

Q4 Define Unit Step, Unit Impulse, Unit Ramp and Unit Parabolic signals. How these signals are interrelated? The Causal Sine sequence is defined as, (15)

$x(n)=\sin \omega n\, u(n) = \{\sin \omega n$ for $n \geq 0$ 0 for $n < 0\}$. Find ROC of its Z-transform.

Q5 (a) List and briefly explain Properties of Laplace Transform. (5)

(b) Consider the following series RLC circuit. It is having an input voltage $V_{In}(t)$ and the current flowing through the circuit is I(t). Obtain its State Space Model. (10)



Q6 (a) Find Fourier Transform of Exponentials and Signum Functions. What are applications of Fourier Transform? (10)

(b) What are Roles of Poles and Zeros of a Transfer Function? Find Poles and Zeros of Transfer Function, $((s + 2) / (s^2 + 0.25))$. (5)

Q7 List Conditions for Existence of Fourier Transform. Explain Discrete Time Fourier Transforms (DTFT) and Inverse Discrete Time Fourier Transforms. (15)

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