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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**Summer Term, End Term Examination August 2024**

**Date**: 06-08-2024

**Time**: 9.30 AM to 12.30 PM

**Max Marks**:100

**Weightage**: 50%

**Summer Term** : 2023-24

**Course Code**:ECE2003**&061ECE3061**

**Course Name**: Signals and Systems

**Program & Sem**: ECE

 **Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Do not write any matter on the question paper other than roll number.*
3. *Any tables/Chart/Graph or data books required.*

**PART A**

**Answer any 5 Questions. Each question carries 6 marks. (5Qx 6M= 30M)**

1. Example of non-causal signal is prediction of tomorrow’s weather based on today’s temperature. Find whether the given signal,  is causal or not.

 (CO1) [Knowledge]

1. The Laplace transform has a number of properties that make it useful for analysing linear dynamical systems. Explain time shifting property of Laplace transform

(CO1) [Knowledge]

1. The properties of z-transform can be used to find closed form of expression for the z-transform of a given sequence. State and prove the conjugation property of z-transform

 (CO2) [Knowledge]

1. Evaluate the convolution sum y(n) of the following two discrete time signals

x(n) = (-1, 1, -2, 3) and h(n) = (1, 4, 8)

(CO2) [Knowledge]

1. Evaluate the convolution sum y(n) of the following two discrete time signals

x(n) = (6, 1, 2, 9,4,5) and h(n) = (-1, -2, -1, 2,-3,7)

 (CO2) [Knowledge]

1. The Z transform has a number of properties that make it useful for analysing linear dynamical systems. Explain time shifting property of Z transform?

(CO1) [Knowledge]

1. In practice, unit step signal is used as a test signal because the response of a system for the unit step signal gives the information about how quickly the system responds to a sudden change in the input signal. Draw the unit step signal and write its equation.

 (CO2) [Knowledge]

**PART B**

**Answer any Four Questions. Each question carries 10 marks. (4Qx 10M= 40M)**

8. A continious-time signal is shown in Figure below. Sketch and label carefully each of the following signals:

(a) x[t- 4] b) x[t - 2] (c) x[t+2] (d) x(-t)



(CO2) [Comprehension]

9.The z-transform is a mathematical tool, which is used to convert the difference equations in time-domain into the algebraic equations in z-domain. Find the z-transform and also mention Region of Convergence [R.O.C] for the following signals.

(i) 
(ii). Justify the answers.

 (CO2) [Comprehension]

10. What is Region of Convergence (ROC) of Z-Transform explain the Properties of ROC of Z-Transform, Explain ROC for three Different Types of Sequences mentioned below with an example

1. Left-Sided Sequence: ROC is ∣z∣>r.
2. Right-Sided Sequence: ROC is ∣z∣<r.
3. Two-Sided Sequence: ROC is r1<∣z∣<r2​.

 (CO1) [Comprehension]

11. A finite sequence x (n) is defined as below find out the Z transform

1. X(n)=(5,2,-2,1,1,-3)



1. X(n)=(4,0,1,2,3,-4)

 

(CO1) [Comprehension]

12. A finite sequence x (n) is defined as below find out the Z transform

1. X(n)=(-3,-2,-1,0,1,-3)

 

1. X(n)=(1,0,-1,-2,3,-4)

 (CO1) [Comprehension]

**PART C**

**Answer any two Questions. Each question carries 15 marks. (2Qx 15M= 30M)**

13. A discrete-time signal is shown in Figure below. Sketch and label carefully each of the following signals:

 (a) x[n- 4] (b) x[n - 2] (c) x[n + 1] (d) x[-n]



 (CO1) [Application]

14. Given the discrete-time signals below, where u[n] is the unit step function, find the Z-transform X(z) and specify the Region of Convergence (ROC).

1. x[n]= 3^n u[n]+ 2^n u[n];
2. x[n]= 2^n u[n]+ 3 (1/2)^n u[n];
3. x[n]= 3 (-1/2)^n u[n]- 2[3^n u[-n-1];

(CO2) [Application]

15. Z-transform helps in system design and analysis.Find the inverse Z-transform for the below expressions using the partial fraction method



 (CO2) [Application]