**Registration No.:** | | | | | | | | | | |

**Total Number of Pages: 02** **Course: B.Tech**

**Sub_Code: REE4D002/REL4D002**

**4th Semester Back Examination: 2024-25**

**SUBJECT: Signal and Systems**

**BRANCH(S): EEE, ELECTRICAL**

**Time: 3 Hours**

**Max Marks: 100**

**Q.Code: S606**

**Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.**

**The figures in the right hand margin indicate marks.**

## Part-I

**Q1** **Answer the following questions:** **(2 x 10)**

**a)** Define even and odd signals.

**b)** Why input-output description of a system is required?

**c)** Define causal and stable systems.

**d)** Write the difference equation for a discrete-time system.

**e)** Why Fourier Series is so important?

**f)** What is time-shifting property in Fourier Transform?

**g)** What is the region of convergence (ROC) in Z- transform? Give an example.

**h)** What is one-sided Z-transform?

**i)** Write the formula for multiplication of two DFTs.

**j)** What is frequency domain sampling?

## Part-II

**Q2** **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

**a)** What is a discrete-time system? Describe various classifications of discrete-time systems.

**b)** With examples, explain simple mathematical manipulations of discrete-time signals.

**c)** Derive the expression for the convolution sum of two discrete-time signals. Explain its properties.

**d)** Explain the properties of LTI systems with suitable examples.

**e)** Explain the procedure for the calculation of Fourier Series coefficients for a periodic signal.

**f)** Explain the difference between Fourier Series and Fourier Transform.

**g)** What are poles and zeros? How are they located? Explain their significance in system analysis.

**h)** Solve any difference equation of your choice using Z-Transform.

**I)** Explain frequency domain sampling with respect to DFT.

j) Discuss the relationship between DFT and DTFT.

k) Derive the system function of any linear time-invariant system using Z-Transform.

l) Explain the properties of IDFT with examples.

## Part-III

**Only Long Answer Type Questions (Answer Any Two out of Four)** **(16 x 2)**

| | | | |
|---|---|---|---|
| **Q3** | **a)** | Explain the classification of discrete-time signals with suitable examples. | **(8)** |
| | **b)** | Define system interconnection and explain different types of interconnections used in discrete-time systems. | **(8)** |
| **Q4** | **a)** | What are autocorrelation and cross-correlation? Explain their properties with mathematical expressions. | **(8)** |
| | **b)** | Explain the implementation of discrete-time systems using block diagrams. | **(8)** |
| **Q5** | **a)** | Derive the expression for the Continuous-Time Fourier Series and explain its properties. | **(8)** |
| | **b)** | State and prove any four properties of Z-transform. | **(8)** |
| **Q6** | **a)** | Define DFT. Derive the formulas for DFT and IDFT. | **(8)** |
| | **b)** | Explain the properties of DFT: periodicity, linearity, symmetry, and circular convolution. | **(8)** |