

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, December – 2024

SIGNALS AND SYSTEMS**(ELECTRONICS AND COMMUNICATION ENGINEERING)****Time: 3 Hours****Max. Marks: 75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

| | Course Outcome | B.T Level | Marks |
|---|----------------|-----------|-------|
| 1. Define orthogonal vector spaces and signal spaces. | CO1 | L1 | 2M |
| 2. Describe the importance of Fourier series in signal analysis. | CO1 | L2 | 3M |
| 3. List some standard signals and their Fourier Transforms. | CO2 | L1 | 2M |
| 4. State the Sampling Theorem and explain its importance in signal processing. | CO2 | L2 | 3M |
| 5. Differentiate between Linear Time-Invariant (LTI) and Linear Time-Variant (LTV) systems. | CO3 | L2 | 2M |
| 6. Discuss the ideal characteristics of low-pass (LPF), high-pass (HPF), and band-pass (BPF) filters? | CO3 | L2 | 3M |
| 7. State Parseval's theorem and explain its importance in signal analysis. | CO4 | L2 | 2M |
| 8. Explain the concept of convolution in the frequency domain. | CO4 | L2 | 3M |
| 9. Describe the concept of waveform synthesis in Laplace Transforms. | CO5 | L2 | 2M |
| 10. How are the discrete-time signals represented using complex exponential and sinusoidal signals? | CO5 | L1 | 3M |

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

| | | | |
|--|-----|----|-----|
| 11. A) Derive the formula for the approximation of a function using a set of orthogonal functions. | CO1 | L3 | 10M |
| OR | | | |
| B) Compute the Trigonometric Fourier coefficients for the periodic function $f(x)=x$ over the interval $[-\pi, \pi]$. | CO1 | L3 | 10M |
| 12. A) Discuss the properties of Fourier Transforms such as linearity, time-shifting, and frequency-shifting, with proofs. | CO2 | L2 | 10M |
| OR | | | |
| B) Derive the Fourier Transform of the signal $f(t)=e^{-at}u(t)$, where $a>0$. | CO2 | L3 | 10M |
| 13. A) Analyze the ideal characteristics of LPF, HPF, and BPF. Why are ideal filters practically unrealizable? | CO3 | L3 | 10M |
| OR | | | |
| B) Design an ideal LPF with a cut-off frequency of 1 kHz and plot its magnitude response. | CO3 | L3 | 10M |
| 14. A) Derive and explain the mathematical expressions for cross-correlation and auto-correlation. | CO4 | L3 | 10M |

OR

- B) Calculate the energy density spectrum of $x(t)=e^{-t^2}$ and verify Parseval's theorem for this signal. CO4 L3 10M
15. A) Determine the Laplace Transform of a periodic square wave with a period T . CO5 L3 10M
- OR**
- B) Show the relationship between the Z-Transform and the Fourier Transform for $z=e^{j\omega}$. CO5 L3 10M