ABV-Indian Institute of Information Technology & Management, Gwalior

EE201: Signals and Systems

Major Examination – Session 2024–25

Maximum Time: 3 Hours **Max Marks: 70**

Note: All questions are compulsory. Use neat diagrams wherever required.

1. (a) Explain the classification of systems based on linearity, causality and stability. (b) Test whether $y(t) = x(t) + x(t-1)$ is causal and stable. (10 Marks)

2. Derive the Fourier Transform of $x(t) = e^{-at}u(t),\ a > 0$ and sketch its spectrum. (7 Marks)

3. A periodic sawtooth waveform is given by $x(t) = t,\ -T/2 < t < T/2$. Derive its Fourier Series coefficients. (7 Marks)

4. Obtain the convolution of $x(t) = u(t)$ and $h(t) = e^{-t}u(t)$. (7 Marks)

5. Derive and explain the Laplace transform of $\sin(\omega t)u(t)$. Discuss the ROC. (7 Marks)

6. State and prove Parseval's relation for Fourier Transform. (7 Marks)

7. Find the Z-transform and ROC of $x[n] = u[n] - u[n-5]$. (7 Marks)

8. Write short notes on any two: (i) Sampling theorem (ii) Hilbert Transform (iii) Relation between Fourier and Laplace Transforms. (10 Marks)