R-15

III Year I Semester

15AEE16-ANALYSIS OF LINEAR SYSTEMS

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Course Objectives:

- *To develop skills to analyze linear dynamic systems in both continuous and discrete – time.*
- *To find the system response in both time and frequency domains, and examine system stability.*
- *To understand the use of the Fourier, Laplace, and Z transforms in analysis of signals and systems.*

UNIT—I: SIGNAL ANALYSIS

Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Exponential and sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM REPRESENTATION

Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function , Properties of Fourier Transform , Parseval's theorem , Fourier transform of some common signals, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

UNIT–III: LAPLACE TRANSFORM APPLICATIONS

Applications of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications

UNIT-IV: SAMPLING

Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

UNIT-V: Z-TRANSFORMS

Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z – Transform of a discrete sequence. Distinction between Laplace, Fourier and Z – Transforms. Region of convergence in Z – Transforms, constraints on ROC for various classes of signals, Inverse Z – Transforms, properties of Z – Transforms.

BOS-chairman

Course Outcomes:

- *A student who successfully fulfils the course requirements will have demonstrated: an ability to recognize, use, and analyze signals coming from diverse disciplines and represent them in terms of elementary signals such as step, ramp, parabolic, sinusoidal, and exponential signals.*
- *An ability to understand basic signals operations such as convolution, correlation, signal shifting, knowledge and understanding of linear system dynamics.*
- *Knowledge of methods for finding the system transient and steady state responses.*
- *Knowledge of main properties of linear feedback systems.*
- *Full understanding of Fourier, Laplace, and Z – transforms and their inverses.*

TEXT BOOKS:

1. Signals, Systems and Communications by B.P. Lathi, BS Publications 2003.
2. Network Analysis and Synthesis – UmeshSinha – SatyaPrakashan Publications

REFERENCE BOOKS:

1. Linear System Analysis – A N Tripathi, New Age International
2. Network and Systems – D Roy Chowdhary, New Age International
3 Engineering Network Analysis and Filter Design – Gopal G Bhisk&Umesh
4. Linear system analysis by A. Cheng, Oxford publishers.

V. Seal
BOS-Chairman