CONTROL SYSTEM ENGINEERING

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1:Introduction to Feedback Control System

Classification of control System, Mathematical models of physical system- Electrical & Mechanical System , Transfer function of electrical systems, Block diagrams and reduction techniques including
signal flow graphs using Mason’s gain formula.

2: Feedback Characteristics of Control system

Feedback & Non-feedback systems, Reduction of parameter variations
by use of feedback, control over system dynamics by use of feedback, control of effect of disturbance signals by use of feedback, The concept of stability, Routh Hurwitz stability criteria.

3 : Time Domain Analysis

Time response of first order & second order system using standard

test

signal, steady state errors and error constants, Root locus techniques-
Basic concept, rules of root locus, application of root locus techniques

for control system.

4:
Frequency
Domain
Analysis

Introduction, correlation between time & frequency domain, Bode plots, gain margin, phase margin, effect of addition of poles & zeros on bode plots, Polar plots, Nyquist stability.stability using Bode plot

5:
State Space
Analysis

Concept of state, state variables & state model State-space representation, computation of the state transition matrix, transfer function from the state model, controllability of linear system, observability of linear system.

6:
Compensators
& controllers

a. Compensators- Need of compensation, lead compensation, lag compensation, Lead-lag compensation.
b. Controllers- ON-OFF controller, Proportional, Integral, derivative &PID controllers, principle and operations. PLC controllers- Block schematic, PLC addressing, Liquid level control using ladder diagram.

Linear Integrated Circuits

Unit - 1 Differential Amplifiers

Differential Amplifier-Configuration, DC & AC Analysis of Dual Input Balanced
Output Configuration. Comparative study of other configuration of Differential
amplifiers, Constant Current Bias, CurrentMirror, DC coupling & Cascade
differential stages, Level Translator & its need

Unit -2 OP-Amp Characteristics
Block Diagram of Op-Amp, Ideal & Practical Op-amp specifications, Transfer
characteristics of Opamp, Op-amp parameters & measurement: Input &outputoffset
voltages, Input & output offset currents, Input Bias current, slew rate, CMRR,
PSRR, Thermal drift. Comparative study of Data Sheets – µA 741, OP 07, LM 324,
LM 311, LM 308, LM380, CA 3140.

Unit 3 Op-Amp Configurations & Frequency Response.
Open Loop & Closed Loop- Inverting, Non-Inverting, and Differential (Using one
op-amp). Analysis for Av, Ri, Ro, Bandwidth, and Total output offset voltage. AC
& DC amplifiers –
All configurations.(Numericals are expected). Open-loop frequency response, Closed
loop frequency response, circuit stability, slew rate.

Unit-4 Linear & Non-Linear Applications
Summing amplifier (Inverting & Non-Inverting), Subtractor, Integrator,
Differentiator, Instrumentation Amplifier (3 op-amps),
Instrumentation amplifier using transducer bridge, Single-Chip Instrumentation
Amplifier(INA Series), I-V & V-I converter. (Numericals are expected).
Comparators, Zero Crossing Detector, Window detector, Schmitt trigger, peak
detector, log and antilog amplifier, precision rectifier, sample and hold circuits

Unit 5 Active Filters and Oscillators
First & Second Order Butterworth Low Pass, High Pass, Band Pass,

Band Reject,
& All-Pass Filters, RC phase Shift oscillator, Weins Bridge Oscillator, &Quadrature
oscillator.
Square wave generator (AstableandMonostableMulti-vibrator)Triangular Wave
generator, V-F, F-V converter using Op-amp

Unit 6 Monolithic IC Applications
IC 555 (Timer): Block Diagram, Multi-vibrators, and Applications.
PLL- Introduction, Block Diagram, Operating Principles & description of
individual blocks, IC 566VCO, IC 565 PLL & Applications.
IC 8038 Waveform generator

Electronic Circuit Design-II

Unit- I: Multistage Amplifier
Need of Cascading, evaluation of Ri, Ro, Ai, Av, Types of coupling, RC coupled,
Transformer coupled, Direct coupled amplifier. Design of two-stage RC coupled
amplifier with and without feedback and Direct coupled amplifier. (Numerical &
Design based examples are expected)

Unit-II: Feedback Amplifier
Need & types of feedback, Advantages of negative feedback, types of negative
feedback (Voltage series, Current series, Voltage shunt, Current shunt feedback
amplifiers), the study of Emitter follower and Darlington amplifier with bootstrapping
principle (Numerical are expected)

Unit- III: Power amplifier
Need of Power amplifier, Classification of power amplifier, Power considerations,
distortion in the power amplifier (Phase, frequency, harmonics), calculation of IInd
Harmonic or distortion using Three-point method, Analysis & Design

of Class A
single-ended transformer-coupled amplifier, Class B amplifier & class B push-pull
amplifier, Cross over distortion, and methods to eliminate cross over distortion,
complimentary symmetry amplifier. (Numerical & Design based examples are
expected)

Unit- IV: Oscillator

Barkhausen's criteria, Frequency and amplitude stability, classification of the oscillator,
RC Oscillators: analysis and design of RC phase shift (Using BJT &FET),
Weybridge using BJT, LC Oscillators: Colpittsand Hartley oscillator using BJT.
Study of Crystal oscillator. (Numerical & Design based examples are expected)

Unit- V: Multivibrator

Transistor as a switch, Transistor switching Parameters, Classification of
Multivibrator, analysis, and design of bistable (Fixed Bias & Self Bias),
monostable&astablemultivibrator (Collector coupled), (Numerical& Design based
examples are expected)

Unit- VI: IC Regulators

Study and design of regulators using 78XX & 79XX, LM317, IC 723. (Numerical & Design
based examples are expected)

Digital Communication

Unit 1 Probability Theory, Random Variable & Process:

Probability, properties of probability joint & conditional probability. Random variables, CDF, PDF Probability mass function Probability density
function Joint CDF & PDF, Statistical Averages, Uniform Distribution Rayleigh
Distribution. Random Processes, Time averaging &Ergodicity, Autocorrelation.

Unit 2 Source Coding:
Quantization – Uniform & Non-Uniform, companding PCM Differential pulse
code modulation (DPCM) Delta modulation (DM), noise in Delta Modulation.
Adaptive Delta Modulation, CVSD. Performance of all coding schemes based on.
Effect of noise, SNR, Bandwidth.

Unit 3 Digital Signaling Formats:
Introduction, NRZ codes, RZ, Phase encoding, M-array formats.
Synchronization: Bit and symbol synchronization, frame synchronization.
Carrier recovery circuits, Scrambler &Unscrambler.

Unit 4 Bandpass Modulation & Demodulation:
Generation, detection,signal space diagram,spectrum, bandwidth, efficiency
&probablity of error analysis of Amplitude shift keying (ASK), phase shift
keying (PSK), Frequency shift keying (FSK), Binary phase-shift keying (BPSK).
Quadrature phase-shift keying (QPSK), Differential phase-shift keying (DPSK)
Differential encoded phase shift keying (DEPSK), Quadrature amplitude
modulation(QAM).

Unit 5 Baseband Transmission & Optimum Detection:
Baseband transmission of binary data, ISI & Its minimization, NYQUIST pulse
shaping criteria, Pulse shaping by digital methods, Eye pattern, M-array
signaling. The optimum receiver matched filters & their properties. Correlation
receiver,adaptive equalization & schemes

Unit 6 Spread Spectrum Modulation:
Introduction, Direct sequence spread spectrum Use of spread spectrum with

CDMA. Ranging using DS spread spectrum. Frequency hopping Spread
Spectrum, generation & characteristics of PN Sequences

Data Structures

UnitNo: 1 Introduction & Overview:

Introduction to theory of data structures, data types, Classification of data
structure, Algorithms: complexity, time space trade-off with example.

UnitNo: 2 Arrays, Records & Pointers:

Introduction, linear arrays, representation of linear array in memory, Algorithm for traversing linear arrays, inserting & deleting,
Sorting: bubble sort, searching: linear search, binary search,Multi dimensional arrays, Pointers: pointer arrays, Records: Record structures,
representation of records in memory, parallel arrays, matrices, sparse matrices.

UnitNo: 3 Linked Lists:

Introduction, linked lists & its representation, Traversing & searching a
linked list, memory allocation, Garbage collection, insertion & deletion
of nodes of linked list, header linked list, two-way lists.

UnitNo: 4 Stacks & Queues:

Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, arithmetic expressions, polish notation, Applications of stacks, stacks & recursion, Queue, representation of queue as an array and as a linked list, circular, double ended, priority, application of queues.

UnitNo: 5 Trees :

Binary Tree: introduction, types, definition, properties, representations,
operations, binary tree traversal, reconstruction, counting number of binary trees, applications.
Advanced trees : AVL trees or height balanced trees, representation operation, Threaded binary trees, Expression trees. Multi way trees: trees,
multi way search trees, B+ trees, Heaps, construction of a Heap.

UnitNo: 6 Graphs &Hashing:

Introduction,Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, linked representation. Operations, Traversing, Posets, Topological
sorting. Hashing, Hash functions, collision, chaining