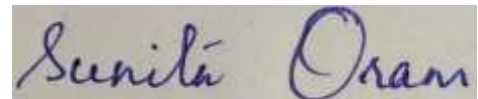


ACADEMIC LESSON PLAN OF SUMMER 2024

Discipline: Electrical Engg.	Semester: 6 th (SEC-B)	Name of the Teaching Faculty: SUNITA ORAM
Subject: TH-3 (Control System Engineering)	No. of days/per week class allotted: 4p/week Tutorial: 1p/week	Semester From: 16 th January 2024 to 26 th April 2024
Week	Class Day	Theory Topics
1 st	1 st	1. FUNDAMENTAL OF CONTROL SYSTEM 1.1. Classification of Control system 1.2. Open loop system & Closed loop system and its comparison
	2 nd	1.3. Effects of Feed back 1.4. Standard test Signals (Step, Ramp, Parabolic, Impulse Functions)
	3 rd	1.5. Servomechanism
	4 th	2. MATHEMATICAL MODEL OF A SYSTEM 2.1. Transfer Function & Impulse response, 2.2. Properties, Advantages & Disadvantages of Transfer Function
	5 th	Tutorial
2 nd	1 st	2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network.
	2 nd	2.5. Mathematical modeling of Electrical Systems (R, L, C, Analogous systems)
	3 rd	Tutorial
	4 th	3. CONTROL SYSTEM COMPONENTS 3.1. Components of Control System
3 rd	5 th	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors. (Contd)
	1 st	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors. (Contd)
	2 nd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.
	3 rd	Tutorial
	4 th	4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS 4.1. Definition: Basic Elements of Block Diagram
4 th	5 th	4.2. Canonical Form of Closed loop Systems 4.3. Rules for Block diagram reduction (Contd)
	1 st	4.3. Rules for Block diagram reduction (Contd) 4.4. Procedure for of Reduction of Block Diagram
	2 nd	4.5. Simple Problem for equivalent transfer function (Contd.)
	3 rd	Tutorial
	4 th	4.5. Simple Problem for equivalent transfer function 4.6. Basic Definition in Signal Flow Graph & properties
5 th	5 th	4.7. Construction of Signal Flow graph from Block diagram 4.8. Mason's Gain formula
	1 st	4.9. Simple problems in Signal flow graph for network (Contd.)
	2 nd	4.9. Simple problems in Signal flow graph for network.
	3 rd	Tutorial
	4 th	5. TIME RESPONSE ANALYSIS. 5.1 Time response of control system. 5.2 Standard Test signal. 5.2.1. Step signal, 5.2.2. Ramp Signal 5.2.3. Parabolic Signal 5.2.4. Impulse Signal 5.3 Time Response of first order system with: 5.3.1. Unit step response
5 th	5.3.2. Unit impulse response. 5.4 Time response of second order system to the unit step input. 5.4.1. Time response specification. (Contd.)	

6 th	1 st	5.4.1. Time response specification. 5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.(Contd.)
	2 nd	5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.
	3 rd	Tutorial
	4 th	5.4.3. Steady state error and error constants(cont.)
	5 th	5.4.3. Steady state error and error constants
7 th	1 st	5 .5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]
	2 nd	5 .6 Effect of adding poles and zero to transfer function.
	3 rd	Tutorial
	4 th	5 .7 Response with P, PI, PD and PID controller(Contd.)
	5 th	5 .7 Response with P, PI, PD and PID controller
8 th	1 st	6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE. 6. 1 Root locus concept.(cont.)
	2 nd	6. 1 Root locus concept.
	3 rd	Tutorial
	4 th	6. 2 Construction of root loci.(cont.)
	5 th	6. 2 Construction of root loci.
9 th	1 st	6. 3 Rules for construction of the root locus. (cont.)
	2 nd	6. 3 Rules for construction of the root locus.(cont.)
	3 rd	Tutorial
	4 th	6. 3 Rules for construction of the root locus.(cont.)
	5 th	6. 3 Rules for construction of the root locus.(cont.)
10 th	1 st	6. 3 Rules for construction of the root locus.
	2 nd	6. 4 Effect of adding poles and zeros to G(s) and H(s).
	3 rd	Tutorial
	4 th	7. FREQUENCY RESPONSE ANALYSIS. 7. 1 Correlation between time response and frequency response.
	5 th	7. 2 Polar plots.(cont.)
11 th	1 st	7. 2 Polar plots.(cont.)
	2 nd	7. 2 Polar plots.(cont.)
	3 rd	Tutorial
	4 th	7. 3 Bode plots.(cont.)
	5 th	7. 3 Bode plots.(cont.)
12 th	1 st	7. 3 Bode plots.(cont.)
	2 nd	7. 4 All pass and minimum phase system. 7. 5 Computation of Gain margin and phase margin(contd.)
	3 rd	7. 4 All pass and minimum phase system. 7. 5 Computation of Gain margin and phase margin
	4 th	Tutorial
	5 th	7. 6 Log magnitude versus phase plot.
13 th	1 st	7. 7 Closed loop frequency response.
	2 nd	8. NYQUIST PLOT 8.1 Principle of argument
	3 rd	8.2 Nyquist stability criterion.(cont.)
	4 th	Tutorial
	5 th	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)

14 th	1 st	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)
	2 nd	8.3 Nyquist stability criterion applied to inverse polar plot.
	3 rd	8.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Nyquist plot.
	4 th	Tutorial
	5 th	8.5 Assessment of relative stability.
15 th	1 st	8.6 Constant M and N circle.(cont.)
	2 nd	8.6 Constant M and N circle
	3 rd	8.7 Nicholas chart.(contd.)
	4 th	8.7 Nicholas chart.
	5 th	Tutorial



Signature of Teaching Faculty

ACADEMIC LESSON PLAN OF SUMMER 2023

Discipline: Electrical	Semester: 6 th (SEC-B)	Name of the Teaching Faculty:
Subject: TH-3 (Control System Engineering)	No. of days/per week class allotted: 4p/week Tutorial: 1p/week	Semester From: 14 th Feb 2023 to 23 rd May 2023
Week	Class Day	Theory Topics
1 st	1 st	1. FUNDAMENTAL OF CONTROL SYSTEM 1.1. Classification of Control system 1.2. Open loop system & Closed loop system and its comparison
	2 nd	1.3. Effects of Feed back 1.4. Standard test Signals (Step, Ramp, Parabolic, Impulse Functions)
	3 rd	1.5. Servomechanism (Contd.)
	4 th	2. MATHEMATICAL MODEL OF A SYSTEM 2.1. Transfer Function & Impulse response, 2.2. Properties, Advantages & Disadvantages of Transfer Function
	5 th	Tutorial
2 nd	1 st	2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network. (contd.)
	2 nd	2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network.
	3 rd	2.5. Mathematical modeling of Electrical Systems (R, L, C, Analogous systems) (Contd.)
	4 th	2.5. Mathematical modeling of Electrical Systems (R, L, C, Analogous systems)
	5 th	Tutorial
3 rd	1 st	3. CONTROL SYSTEM COMPONENTS 3.1. Components of Control System
	2 nd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors. (Contd.)
	3 rd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors. (Contd.)
	4 th	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.
	5 th	Tutorial
4 th	1 st	4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS 4.1. Definition: Basic Elements of Block Diagram
	2 nd	4.2. Canonical Form of Closed loop Systems 4.3. Rules for Block diagram reduction (Contd.)
	3 rd	4.3. Rules for Block diagram reduction (Contd.) 4.4. Procedure for of Reduction of Block Diagram
	4 th	4.5. Simple Problem for equivalent transfer function (Contd.)
	5 th	Tutorial
5 th	1 st	4.5. Simple Problem for equivalent transfer function 4.6. Basic Definition in Signal Flow Graph & properties
	2 nd	4.7. Construction of Signal Flow graph from Block diagram 4.8. Mason's Gain formula
	3 rd	4.9. Simple problems in Signal flow graph for network (Contd.)
	4 th	4.9. Simple problems in Signal flow graph for network.

	5 th	Tutorial
6 th	1 st	5. TIME RESPONSE ANALYSIS. 5 . 1 Time response of control system.5 . 2 Standard Test signal. 5.2.1. Step signal, 5.2.2. Ramp Signal 5.2.3. Parabolic Signal 5.2.4. Impulse Signal 5 . 3 Time Response of first order system with: 5.3.1. Unit step response
	2 nd	5.3.2. Unit impulse response. 5 . 4 Time response of second order system to the unit step input. 5.4.1. Time response specification.(Contd.)
	3 rd	5.4.1. Time response specification. 5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.(Contd.)
	4 th	5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.
	5 th	Tutorial
7 th	1 st	5.4.3. Steady state error and error constants(cont.)
	2 nd	5.4.3. Steady state error and error constants
	3 rd	5 .5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]
	4 th	5 .6 Effect of adding poles and zero to transfer function.
	5 th	Tutorial
8 th	1 st	5 .7 Response with P, PI, PD and PID controller(Contd.)
	2 nd	5 .7 Response with P, PI, PD and PID controller
	3 rd	6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE. 6. 1 Root locus concept.(cont.)
	4 th	6. 1 Root locus concept.
	5 th	Tutorial
9 th	1 st	6. 2 Construction of root loci.(cont.)
	2 nd	6. 2 Construction of root loci.
	3 rd	6. 3 Rules for construction of the root locus. (cont.)
	4 th	6. 3 Rules for construction of the root locus.(cont.)
	5 th	Tutorial
10 th	1 st	6. 3 Rules for construction of the root locus.(cont.)
	2 nd	6. 3 Rules for construction of the root locus.(cont.)
	3 rd	6. 3 Rules for construction of the root locus.
	4 th	6. 4 Effect of adding poles and zeros to G(s) and H(s).
	5 th	Tutorial
11 th	1 st	7. FREQUENCY RESPONSE ANALYSIS. 7. 1 Correlation between time response and frequency response.
	2 nd	7. 2 Polar plots.(cont.)
	3 rd	7. 2 Polar plots.(cont.)
	4 th	7. 2 Polar plots.(cont.)
	5 th	Tutorial
12 th	1 st	7. 3 Bode plots.(cont.)
	2 nd	7. 3 Bode plots.(cont.)
	3 rd	7. 3 Bode plots.(cont.)
	4 th	7. 4 All pass and minimum phase system. 7. 5 Computation of Gain margin and phase margin
	5 th	Tutorial
13 th	1 st	7. 6 Log magnitude versus phase plot.
	2 nd	7. 7 Closed loop frequency response.
	3 rd	8. NYQUIST PLOT

		8.1 Principle of argument
	4 th	8.2 Nyquist stability criterion.(cont.)
	5 th	Tutorial
14 th	1 st	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)
	2 nd	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)
	3 rd	8.3 Nyquist stability criterion applied to inverse polar plot.
	4 th	8.4 Effect of addition of poles and zeros to $G(S) H(S)$ on the shape of Nyquist plot.
	5 th	Tutorial
15 th	1 st	8.5 Assessment of relative stability.
	2 nd	8.6 Constant M and N circle.(cont.)
	3 rd	8.6 Constant M and N circle
	4 th	8.7 Nicholas chart.
	5 th	Tutorial

Signature of Teaching Faculty

