ACADEMIC LESSON PLAN OF SUMMER 2024

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

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

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

Signature of Teaching Faculty

ACADEMIC LESSON PLAN OF SUMMER 2023

Discipline: Electrical	Semester: 6th (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: 14th Feb 2023 to 23rd May2023
Week	Class Day	Theory Topics
1st	1st	1. FUNDAMENTAL OF CONTROL SYSTEM 1.1. Classification of Control system 1.2. Open loop system & Closed loop system and its comparison
	2nd	1.3. Effects of Feed back 1.4. Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)
	3rd	1.5. Servomechanism(Contd.)
	4th	2. MATHEMATICAL MODEL OF A SYSTEM 2.1. Transfer Function & Impulse response, 2.2. Properties, Advantages & Disadvantages of Transfer Function
	5th	Tutorial
2nd	1st	2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network.(contd.)
	2nd	2.3. Poles & Zeroes of transfer Function 2.4. Simple problems of transfer function of network.
	3rd	2.5. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)(Contd.)
	4th	2.5. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)
	5th	Tutorial
3rd	1st	3. CONTROL SYSTEM COMPONENTS 3.1. Components of Control System
	2nd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.(Contd.)
	3rd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.(Contd.)
	4th	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.
	5th	Tutorial
4th	1st	4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS 4.1. Definition: Basic Elements of Block Diagram
	2nd	4.2. Canonical Form of Closed loop Systems 4.3. Rules for Block diagram reduction(Contd.)
	3rd	4.3. Rules for Block diagram reduction(Contd) 4.4. Procedure for of Reduction of Block Diagram
	4th	4.5. Simple Problem for equivalent transfer function(Contd.)
	5th	Tutorial
5th	1st	4.5. Simple Problem for equivalent transfer function 4.6. Basic Definition in Signal Flow Graph & properties
	2nd	4.7. Construction of Signal Flow graph from Block diagram 4.8. Mason‘s Gain formula
	3rd	4.9. Simple problems in Signal flow graph for network(Contd.)

	4th	4.9. Simple problems in Signal flow graph for network.
	5th	Tutorial
6th	1st	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
	2nd	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.)
	3rd	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.)
	4th	5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error.
	5th	Tutorial
7th	1st	5.4.3. Steady state error and error constants(cont.)
	2nd	5.4.3. Steady state error and error constants
	3rd	5 .5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]
	4th	5 .6 Effect of adding poles and zero to transfer function.
	5th	Tutorial
8th	1st	5 .7 Response with P, PI, PD and PID controller(Contd.)
	2nd	5 .7 Response with P, PI, PD and PID controller
	3rd	6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE. 6. 1 Root locus concept.(cont.)
	4th	6. 1 Root locus concept.
	5th	Tutorial
9th	1st	6. 2 Construction of root loci.(cont.)
	2nd	6. 2 Construction of root loci.
	3rd	6. 3 Rules for construction of the root locus. (cont.)
	4th	6. 3 Rules for construction of the root locus.(cont.)
	5th	Tutorial
10th	1st	6. 3 Rules for construction of the root locus.(cont.)
	2nd	6. 3 Rules for construction of the root locus.(cont.)
	3rd	6. 3 Rules for construction of the root locus.
	4th	6. 4 Effect of adding poles and zeros to G(s) and H(s).
	5th	Tutorial
11th	1st	7. FREQUENCY RESPONSE ANALYSIS. 7. 1 Correlation between time response and frequency response.
	2nd	7. 2 Polar plots.(cont.)
	3rd	7. 2 Polar plots.(cont.)
	4th	7. 2 Polar plots.(cont.)
	5th	Tutorial
12th	1st	7. 3 Bode plots.(cont.)
	2nd	7. 3 Bode plots.(cont.)
	3rd	7. 3 Bode plots.(cont.)
	4th	7. 4 All pass and minimum phase system. 7. 5 Computation of Gain margin and phase margin
	5th	Tutorial
13th	1st	7. 6 Log magnitude versus phase plot.
	2nd	7. 7 Closed loop frequency response.

	3rd	8. NYQUIST PLOT 8.1 Principle of argument
	4th	8.2 Nyquist stability criterion.(cont.)
	5th	Tutorial
14th	1st	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)
	2nd	8.3 Nyquist stability criterion applied to inverse polar plot.(cont.)
	3rd	8.3 Nyquist stability criterion applied to inverse polar plot.
	4th	8.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Nyquist plot.
	5th	Tutorial
15th	1st	8.5 Assessment of relative stability.
	2nd	8.6 Constant M and N circle.(cont.)
	3rd	8.6 Constant M and N circle
	4th	8.7 Nicholas chart.
	5th	Tutorial

Signature of Teaching Faculty