Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E./B.Tech (Full Time/Part Time) EXAMINATIONS, APRIL/MAY 2025

EE5402 CONTROL SYSTEMS

(Additional Semilog graph sheet to be supplied on demand)

Time: 3hrs Max.Marks: 100

BL – Bloom's Taxonomy Levels

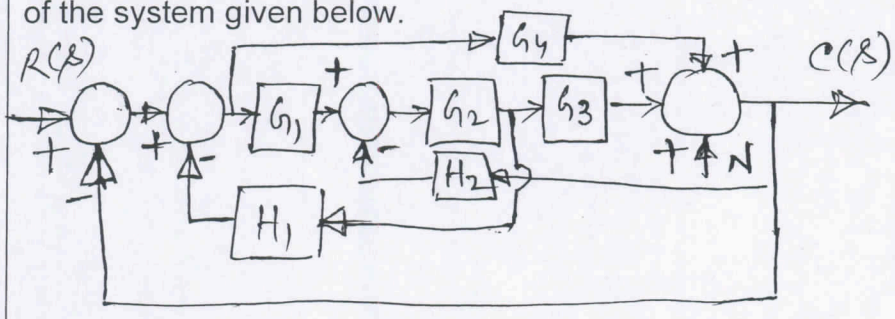
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

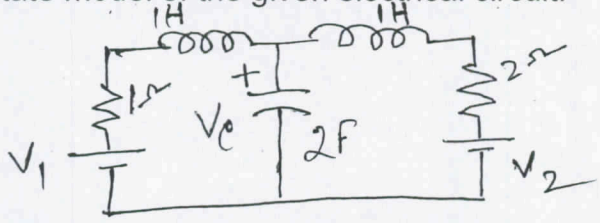
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	State the Principle of Superposition.	2	CO1	L2
2	Why negative feedback is used in Control Systems?	2	CO1	L1
3	What are standard test signals?	2	CO2	L1
4	How do you find open loop gain at break away point on the root loci?	2	CO2	L2
5	Draw the polar plot for $G(s) = k/s^2(s+1)(s+2)$.	2	CO3	L1
6	What is effect of adding a lag compensator?	2	CO3	L1
7	What is non uniqueness of state space model?	2	CO4	L1
8	Define controllability.	2	CO4	L2
9	What is the necessity of compensator in system?	2	CO5	L1
10	What is the effect of PID control in system?	2	CO5	L2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a)	Using Block Diagram Reduction Technique, obtain C(s)/R(s) of the system given below. 	13	CO1	L3
	OR			

11 (b)	Convert the Block diagram of the system given in fig 11(a) into a Signal Flow Graph and determine the transfer functions C(s)/N(s) using Mason's Formula.	**13**	CO1	L4
12 (a)	A unity feedback system has the forward path transfer function G(s) = 25/[s(s+2)]. Determine the damping ratio, undamped frequency, damped frequency, peak overshoot, peak time and settling time. What is the response c(t) when it is excited by a univ step input when all initial conditions are zero.	**13**	CO2	L3
	OR			
12 (b)	A unity feedback system has the loop transfer function $G(s) = k(s+3)/[(s^2+2s+2)]$. Sketch the Root Locus showing all the relevant points. Find the value of k when damping ratio is 0.5.	**13**	CO2	L3
13 (a)	Sketch the Bode plots for a unity feedback system whose open loop transfer function is $G(s) = 10/[s^2(0.5s+1)(0.2s+1)]$. Comment its closed loop stability.	**13**	CO3	L4
	OR			
13 (b)	Sketch the Nyquist plot for a unity feedback system whose open loop transfer function is G(s) = 10/[s(s+1)(s+2)]. Comment its closed loop stability.	**13**	CO3	L4
14 (a)	Obtain the State model of the given electrical circuit. 	**13**	CO4	L4
	OR			
14 (b)	A Linear System is described by the transfer function C(s)/R(s) = (3s-4)/(s+2)(s+3). Develop a canonical state model. Determine the State x(t) when it is subjected to unit step function.	**13**	CO4	L4
15 (a)	Realize a Lead Compensator using RLC circuit. Derive the transfer function of it. Derive the lead compensating network parameters to provide the compensator transfer function $G_c(s) = (1+0.2s)/(1+0.05s)$.	**13**	CO5	L4
	OR			
15 (b)	Design a suitable lag compensating network for G(s) = k/[s(s+2)(s+20)] to meet the following specifications k_v = 20 sec^{-1} and PM ≥ 35°. Comment its closed loop stability.	**13**	CO5	L5

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Derive the step response of a II order underdamped system and therefrom obtain the rise time and settling time.	**15**	CO5	L5