



**B.Tech V Semester Supplementary Examinations, July 2024**  
**CONTROL SYSTEMS**  
 (ECE)

**Maximum Marks: 70**

**Date:30.07.2024 Duration: 3 hours**

- Note:**
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10X2M=20 Marks)			
1	State the effects of positive and negative feedback in control systems.	CO1	L2
2	What is block diagram? What are the basic components of block diagram?	CO1	L1
3	List the time domain specifications.	CO2	L1
4	Mention the characteristics of PI controller.	CO2	L2
5	What is centroid? How is the centroid calculated?	CO3	L1
6	How phase margin determined from Bode's plot?	CO3	L3
7	Define gain margin in Nyquist plot.	CO4	L1
8	What are the two situations in which compensation is required?	CO4	L2
9	Define state variable.	CO5	L1
10	Give the properties of state transition matrix.	CO5	L2
Part-B		CO	Bloom Tx level
Answer All the following questions. (5X10M=50Marks)			
11	For the mechanical system shown in figure, draw the force-voltage and force-current analogous circuits. [10M]	CO1	L4
OR			
12	Find the overall transfer function of the system whose signal flow graph is shown below. [10M]	CO1	L4

13	A unity feedback control system has an open loop transfer function, $G(s) = 10/S(S+2)$ . Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units. [10M]	CO2	L3
	OR		
14	Define steady state error. Derive the static error components for Type 0, Type 1 and Type 2 systems. [10M]	CO2	L2
15	Sketch the root locus of the system whose open loop transfer function is $G(s)H(s) = K/S(S+2)(S+4)$ . [10M]	CO3	L4
	OR		
16	Draw the Bode magnitude and phase angle plots for the transfer function $G(S) = \frac{2000(S+1)}{S(S+10)(S+40)}$ [10M]	CO3	L5
17	Draw the Nyquist plot for the system whose open loop transfer function is $G(S)H(S) = \frac{K(1+0.5S)(1+S)}{(10S+1)(S-1)}$ . Determine the range of K for which closed loop system is stable. [10M]	CO4	L4
	OR		
18	Consider a unity feedback system with open loop transfer function $G(s)=100/(s+1)(s+2)(s+10)$ . Design a PID controller, so that the phase margin of the system is $45^\circ$ at a frequency of 4 rad/sec and the steady state error for unit ramp input is 0.1 [10M]	CO4	L4
19	A. Define state, state variable and state equation. [5M] B. Derive the expression for the transfer function from the state model. [5M] $\dot{X} = Ax + Bu$ and $y = Cx + Du$	CO5	L3
	OR		
20	Investigate the controllability and observability of the following system: [10M] $\dot{X} = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; Y = [0 \quad 1]X$	CO5	L5