Question Paper Code: R18A21EE04

R18

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, December – 2024

CONTROL SYSTEMS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max.Marks:75**

Section – A (Short Answer type questions) (25 Marks)

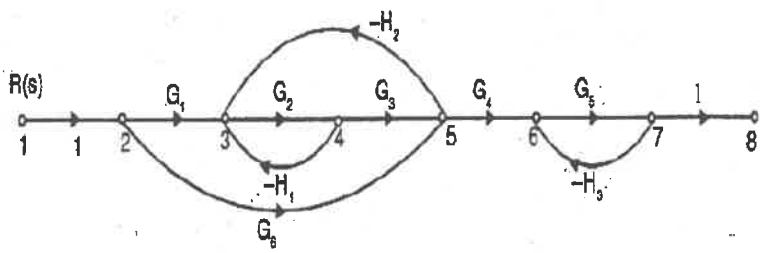
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Illustrate the factors get affected by feedback in control systems.	CO1	L2	2M
2.	Define the following terms. i) Source node ii) Non touching loops iii) Forward path	CO1	L1	3M
3.	The damping ratio of system is 0.6 and the natural frequency of oscillation is 8 rad/sec. determine the rise time.	CO2	L2	2M
4.	Examine the effects of PI, PD controllers in a system.	CO2	L2	3M
5.	Analyse the effects of adding poles and zeros to a system.	CO3	L2	2M
6.	List out the steps involved in root locus technique.	CO3	L1	3M
7.	Define Gain margin and Phase Margin.	CO4	L1	2M
8.	Sketch the polar-plot for Type-2, Order-4 system.	CO4	L2	3M
9.	Sketch the state diagram for state space model.	CO5	L2	2M
10.	Define homogeneous state equation and give the solution of homogeneous state equations.	CO5	L1	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	Determine the closed loop transfer function for the given signal flow graph.	CO1	L3	10M



OR

B)	Explain about open loop and closed loop systems with one example.	CO1	L3	10M
12. A)	Determine the step, ramp and parabolic error constants of the unity feedback control system with the given open loop transfer function $G(S) = \frac{10}{S(1+0.1S)(1+10S)}$	CO2	L3	10M

OR

B)	Analyze the first order system response for unit step signal as an input.	CO2	L3	10M
13. A)	Using Routh Hurwitz criterion, determine the stability of the system represented by the characteristic equation $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$	CO3	L3	10M

OR

B)	Sketch the root-locus of the system whose open-loop transfer function is $G(S)=\frac{K}{S(S+1)(S+2)}$.	CO3	L3	10M
14. A)	Draw the electrical circuit diagram that represents the Lead compensator and explain in detail.	CO4	L3	10M
	OR			
B)	Construct the Nyquist-plot for given open loop transfer function $G(S)=\frac{K}{S(S+2)(S+10)}$. Determine the range of K for which closed loop system is stable.	CO4	L3	10M
15. A)	Determine the transfer matrix for MIMO system given by $\dot{X}(t)=AX(t)+BU(t)$; $Y(t)=CX(t)+DU(t)$ where $A=\begin{bmatrix}0 & 3\\ -2 & -5\end{bmatrix}$; $B=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$; $C=\begin{bmatrix}2 & 1\\ 1 & 0\end{bmatrix}$; D=[0].	CO5	L3	10M
	OR			
B)	Define state transition matrix. Obtain state transition matrix if $A=\begin{bmatrix}1 & 1\\ 2 & -1\end{bmatrix}$	CO5	L3	10M