



R22 Regulation **Subject code:4E5DA**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Regular Examinations, December 2024

CONTROL SYSTEMS
 (ECE)

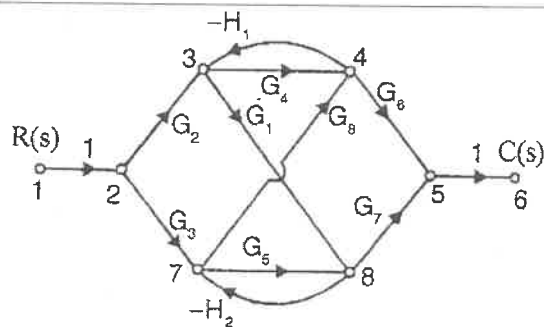
Maximum Marks: 60

Date:23.12.2024

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 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 (10X1M=10 Marks)			
1.a)	State the Manson's gain formula.	1	L1
b)	What are the basic properties of SFG?	1	L1
c)	What are the standard test signals?	2	L1
d)	What is meant by characteristic equation?	2	L2
e)	Outline the Bode plot for a Proportional Integral controller.	3	L1
f)	What are the advantages of frequency domain analysis?	3	L2
g)	State the Nyquist criterion.	4	L1
h)	What is the effect on polar plot if a pole is added to the transfer function?	4	L1
i)	What is state?	5	L1
j)	List the advantages of state variable representation.	5	L1
Part-B			
Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
2	For the system represented by the block diagram shown in figure. Find C/R. [10M]	1	L3
OR			
3	Find the overall gain $C(s)/R(s)$ for the signal flow graph shown in figure. [10M]	1	L3



4	A. Write the equations for time domain specifications of a standard second order system with unit step input. [5M]	2	L3
	B. Explain the effect of Proportional control action on the performance of a second order system. [5M]	2	L3
OR			
5	For a unity feedback system given by $G(s) = \frac{20(s+2)}{s(s+3)(s+4)}$. Find the steady state error for $r(t) = 3u(t) + 5tu(t)$. [10M]	2	L4
6	A. Determine the RH stability of given characteristic equation. [5M] $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$.	3	L3
	B. Sketch the root locus of the system, whose open loop transfer function is, [5M] $G(s) = \frac{K(s+15)}{s(s+1)(s+5)}$	3	L4
OR			
7	A. Determine the stability of the system with characteristic equation $7S^5 + 4S^4 + 10S^3 + 2S^2 + 3S + 6 = 0$. [5M]	3	L4
	B. Define and derive the breakaway point on the root locus. [5M]		
8	Investigate closed loop stability of a system having $G(S)H(S) = K(s+4)/s(s-2)$ using Nyquist criterion. Determine the limiting value of 'K' for stability. [10M]	4	L4
OR			
9	Derive the transfer function of lead compensator with its frequency response. [10M]	4	L4
10	A. Explain various methods of evaluation of state transition matrix. [5M]	5	L4
	B. Obtain the transfer function for linear time invariant system [5M]		
OR			
11	The state variable formulation of a system is given by [5M+5M] $\dot{x} = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$. Find the following: a) Transfer function of the system b) State transaction matrix and	5	L3