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School of Engineering Sciences & Technology
New Delhi-110062
Even Semester Examination 2023

Paper Name: Control Systems
Time: 3 Hours

Paper Code: BTECE 602
Maximum Marks: 75

Section A

Note: Attempt ALL the questions

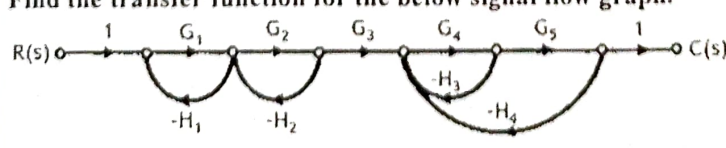
7x5=35

Q. No.	Question	Marks	CO	BL
1.	What is the difference between an open loop and a closed loop control system? Establish the relation between their transfer functions.	5	CO1	3
2.	For a given transfer function $X(s) = \frac{10}{(s^2+s+1)(s+3)}$, find out the approximate transfer function after applying the concept of dominant pole.	5	CO1, CO4	1
3.	Analyse the ramp response of a 1 st order system. Sketch its output response.	5	CO2	5
4.	Using Routh Hurwitz Stability Criteria, find the stability of the following: (a) $s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5$ (b) $s^3 + 3s^2 + 2s + 6$	5	CO4	5
5.	Given a negative unity feedback system with open loop transfer function, $G(s) = \frac{s+8}{s^2 + \alpha s - 4}$ Calculate the value of α . Consider α as a parameter.	5	CO1	6
6.	Determine the rules for drawing the Nyquist plot. Also explain phase crossover frequency and gain crossover frequency?	5	CO3	6
7.	Describe the basic concepts of state space model	5	CO5	4

Section B

Note: Attempt any FOUR (4) Questions

(4x10=40)

Q. No.	Question	Marks	CO	BL
1.	Find the transfer function for the below signal flow graph. 	10	CO1	3

2.	Draw the polar plot and find phase crossover frequency for the following open loop transfer functions: a) $GH(s) = \frac{10}{s^2(s+1)(s+2)}$ b) $GH(s) = \frac{10}{s^3(s+1)(s+2)}$	10	CO4	4
3.	Draw the root locus for the given open loop transfer function. $G(s) = \frac{k}{s(s+1)(s+2)}$	10	CO2	3
4.	Write the short notes on the following: (a) Centroid (b) Break-away point (c) Break-in point (d) Angle of Asymptote	10	CO4, CO5	2
5.	An open loop transfer function for a negative unity feedback system is given as: $G(s) = ke^{-Ts}$ Where k and T are variable and are greater than 0. Find the stability of the system using Routh Stability Criterion.	10	CO3	6
6.	Analyse the step response of a 2nd order system. Consider all cases of damping and sketch their output responses.	10	CO2	4

BL : Bloom's Taxonomy Level (1-Remembering, 2-Understanding, 3-Appling, 4- Analysing, 5-Evaluating, 6- Creating)