

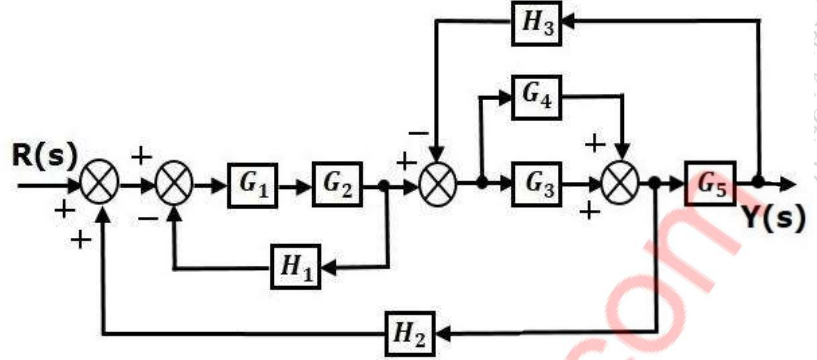
University of Mumbai
Examinations Summer 2022

Time: 2hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In open loop control system
Option A:	the control action depends on the size of the system
Option B:	the control action depends on system variables
Option C:	the control action depends on the input signal
Option D:	the control action is independent of the output
2.	The overall transfer function of two blocks in parallel are :
Option A:	Sum of individual gain
Option B:	Product of individual gain
Option C:	Difference of individual gain
Option D:	Division of individual gain
3.	The system in originally critically damped if the gain is doubled the system will be
Option A:	Remains same
Option B:	Overdamped
Option C:	Under damped
Option D:	Undamped
4.	Routh Hurwitz criterion gives:
Option A:	Number of roots in the right half of the s-plane
Option B:	Value of the roots
Option C:	Number of roots in the left half of the s-plane
Option D:	Number of roots in the top half of the s-plane
5.	If root loci plots of a particular control system do not intersect the imaginary axis at any point, then the gain margin of the system will be
Option A:	0
Option B:	0.707
Option C:	1
Option D:	Infinite
6.	For a stable closed loop system, the gain at phase crossover frequency should always be
Option A:	< 20 dB
Option B:	< 6 dB
Option C:	> 6 dB
Option D:	> 0 dB
7.	The polar plot of a transfer function passes through the critical point (-1,0). Gain margin is
Option A:	0
Option B:	-1 dB
Option C:	1 dB
Option D:	Infinity

8.	The frequency at which the Nyquist diagram cuts the unit circle is known as
Option A:	Phase crossover frequency
Option B:	Gain crossover frequency
Option C:	Damping frequency
Option D:	Corner frequency
9.	In a bode magnitude plot, which one of the following slopes would be exhibited at high frequencies by a 4th order all-pole system
Option A:	80 dB/decade
Option B:	40 dB/decade
Option C:	-80dB/decade
Option D:	-40 dB/decade
10.	Which among the following plays a crucial role in determining the state of dynamic system
Option A:	State vector
Option B:	State variables
Option C:	State space
Option D:	State scalar

Q2	Solve any Two Questions out of Three 10 marks each
A	(i) Give comparison between open loop and closed loop control systems (ii) What are the effects of feedback on a system?
B	Find the transfer function of the following system using block reduction technique 
C	Explain Pole Placement method in detail.

Q3	Solve any Two Questions out of Three 10 marks each
A	A unity feedback system has $G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$. Determine (i) Type of the system (ii) Static error coefficients and (iii) Steady state error for ramp input with magnitude 4.
B	Draw the Root Locus for the system $G(s)H(s) = \frac{s}{(s+3)(s+6)}$
C	Obtain the state model for the system with transfer function $\frac{Y(s)}{U(s)} = \frac{3s+4}{s^2+5s+6}$

Q4	Solve any Two Questions out of Three 10 marks each
A	(i) Define Gain margin and Phase margin. Explain how these margins are used for stability analysis (ii) Write a short note on Lag-Lead Compensator
B	Sketch the Bode plot for the following transfer function and determine Gain margin and Phase margin. $G(s) = \frac{0.75(1+0.2s)}{s(1+0.5s)(1+0.1s)} ; H(s) = 1$
C	Draw the Nyquist plot for the given open loop transfer function and test the stability. $G(s)H(s) = \frac{1}{(s+1)(s+2)}$