

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANGEMENT/
COMMERCIAL PRACTICE-APRIL 2022**

CONTROL SYSTEMS

[Maximum Marks:100]

[Time: 3 hours]

PART - A

Marks

I. Answer **all** questions in one or two sentences. Each question carries 2 marks.

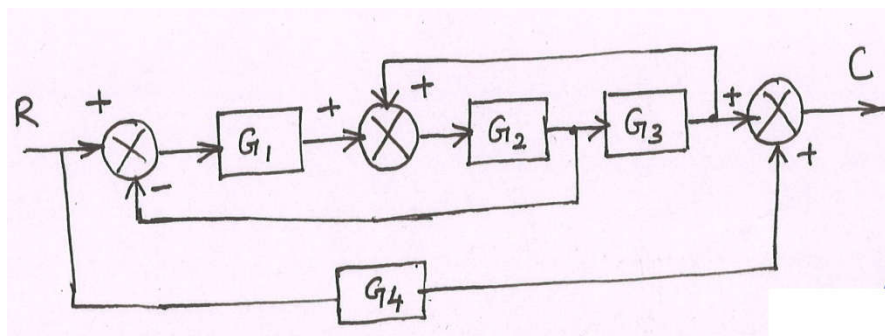
1. List the types of mathematical models of a system.
2. Interpret the term order of a system.
3. Define steady state error of a system.
4. What is frequency response of a control system.
5. Define root locus.

(5 x 2 = 10)

PART - B

II Answer **any five** f the following questions. Each question carries 6 marks.

1. Distinguish linear time invariant and linear time variant systems.
2. Derive the Laplace transform of $\sin\omega t$.
3. Derive the transfer function of a series RLC circuit
4. Draw the signal flow graph for the block diagram shown in figure.



5. Define static position, static velocity and acceleration error constants.
6. State absolute stability, relative stability and marginal stability of a system.
7. Draw the root locus for the transfer function $G(s) = \frac{(s+4)}{(s+1)}$.

(5 x 6 = 30)

PART – C

(Answer *one full question from each unit*. Each full question carries 15 marks.)

UNIT - I

- III (a) Derive the Laplace transform of step and ramp signals. (10)
 (b) Compare open loop and closed loop systems. (5)

OR

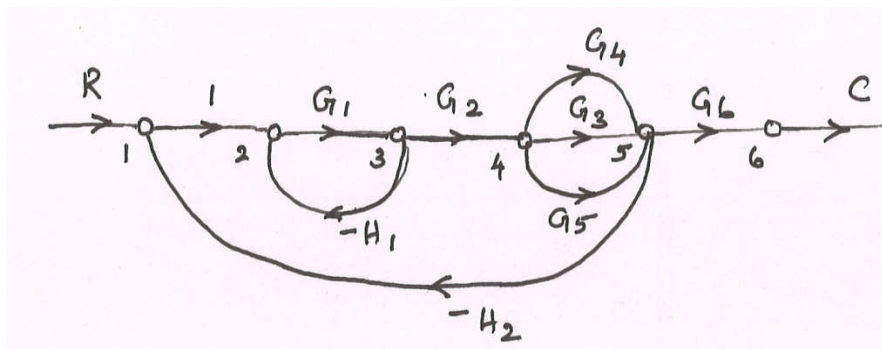
- IV (a) Obtain the solution of the equation $\ddot{y}(t) + 5\dot{y}(t) + 6y(t) = 12$. $Y(0) = \dot{y}(0) = 0$. (10)
 (b) State differentiation and integration theorem of Laplace transform. (5)

UNIT –II

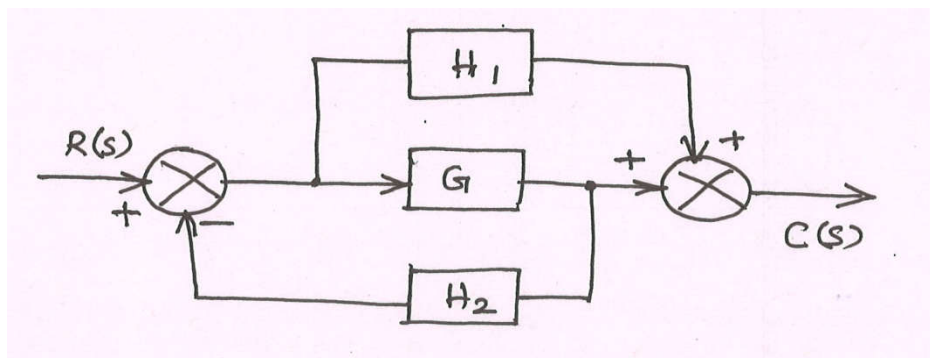
- V (a) Define the parameters of signal flow graph. (10)
 (b) Define analogous systems. Derive force voltage analogy. (5)

OR

- VI (a) Write Mason's gain formula and find the overall transfer function of the Signal flow graph shown in figure. (10)



- (b) Reduce the block diagram and find the overall transfer function. (5)



UNIT – III

- VII (a) Determine the stability of the system using Routh Hurwitz criteria.
 $S^5 + 6S^4 + 3S^3 + 2S^2 + S + 1 = 0$ (8)
- (b) Explain the response of first order system for unit impulse response. (7)

OR

- VIII (a) Derive the steady state error when the input is unit step signal. (8)
- (b) Explain Routh Hurwitz criteria to determine the stability of a system. (7)

UNIT –IV

- IX (a) Define phase margin, phase cross over frequency, gain margin and gain cross over frequency. (8)
- (b) Explain the procedure to draw root locus. (7)

OR

- X (a) Draw the complete Bode plot for the function $\frac{1}{1+Ts}$ (10)
- (b) List the advantages of Bode Plot (5)
