

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL – 2021**

CONTROL ENGINEERING

[Maximum Marks: 75]

[Time: 2.15 Hours]

PART-A

(Answer **any three** questions in one or two sentences. Each question carries 2 marks)

I

1. Define Control Systems.
2. Define transfer function of a system.
3. State Mason's gain formula.
4. Define Type of a system.
5. Define the term Frequency response of a system. (3×2=6)

PART-B

(Answer **any four** of the following questions. Each question carries 6 marks)

II

1. Differentiate open loop and closed loop system.
2. Find the Laplace transform of the signal $e^{4t} \sin 2t + t \cos 3t$.
3. Obtain the overall transfer function of the block diagram shown in fig.(1) using the block diagram reduction rules.

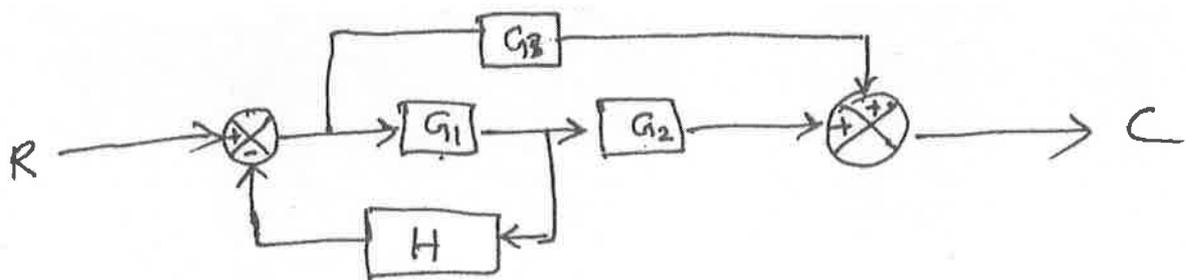


Fig.(1)

4. Define damping ratio, natural frequency and critical damping.
5. Explain static position, velocity and acceleration error constants.
6. Determine the stability of the system represented by the given characteristic equation $S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$.
7. Explain Bode plot (4×6=24)

PART-C

(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT-I

III (a) Find the Laplace transform of (i) e^{-at} (ii) $A t$ (iii) $\sin at$. (9)

(b) Given that $X(S) = \frac{8}{S} + \frac{9S}{(3S^2+7)} + \frac{1}{S^2+2}$ (6)

OR

IV (a) Describe linear time invariant and linear time variant system. (7)

(b) Find the inverse Laplace transform of

(i) $\frac{S+1}{S^2+6S+25}$

(ii) $\frac{2}{S(S+1)(S+2)}$ (8)

UNIT - II

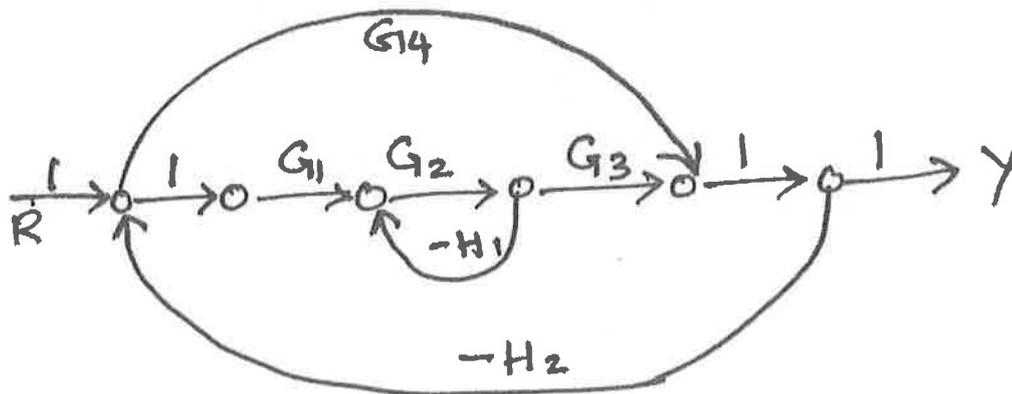
V (a) Describe Torque – Voltage analogy. (7)

(b) Express any four rules of signal flow graph reduction for finding the overall transmittance. (8)

OR

VI (a) Describe the Force – Current analogy. (7)

(b) Find the transfer function for the following signal flow graph. (8)



UNIT - III

VII (a) Explain any three test input signals used in Time response analysis. (6)

(b) Obtain the time response analysis for second order system with unit step input signal in underdamped condition. (9)

OR

- VIII (a) Obtain the time response of first order system with unit step input. (8)
(b) Derive the steady state error for type 2 system with unit ramp input. (7)

UNIT – IV

- IX (a) Draw the bode plot for $1+TS$. (8)
(b) Explain absolute and relative stability of a control system. (7)

OR

- X (a) Explain the procedure to construct root locus. (7)
(b) State the following.
(i) gain margin (ii) phase margin
(iii) phase cross over frequency (iv) gain cross over frequency (8)
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