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

CONTROL SYSTEMS

[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 linear time variant system.

2. Define transfer Function.

3. Define Breakaway Point in Root Locus.

4. State Type of a system.

5. Define Phase margin. (3 x 2 = 6)

PART-B

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

II 1. Derive the Laplace transform of e^{at} and sin at.

2. Derive general transfer function of Mechanical Translational system with spring, dashpot and mass.

3. Draw the block diagram of a Close Loop Control System and explain each block.

4. Explain Force – Voltage Analogy with respect to a series RLC Circuit.

5. Write short note on Static Error Coefficients.

6. State the two special cases that occur in Routh's Table. How are they solved?

7. Describe Gain Cross over Frequency and Phase Cross over Frequency. (4 x 6 = 24)

PART-C

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

UNIT – I

III (a) Compare open loop and closed loop control systems. (10)

(b) State and prove differentiation theorem. (5)

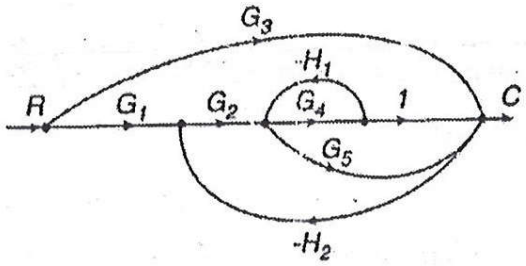
OR

IV (a) Determine the inverse Laplace transform of the function $X(s) = 1/(S^2+4S+8)$. (10)

(b) State and prove integration theorem. (5)

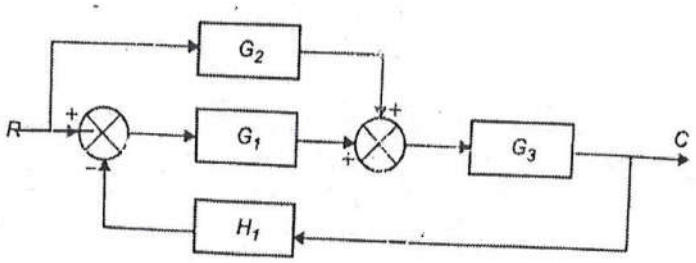
UNIT - II

V Obtain overall transfer function of the system shown below using signal flow graph method. (15)



OR

VI (a) Obtain overall transfer function of control system shown below using block reduction method. (10)



(b) Explain the different parameters of signal flow graph. (5)

UNIT- III

VII Derive steady state error in terms of Kp, Kv & Ka for type 0 system with unit step, ramp and parabolic inputs. (15)

OR

VIII (a) Explain about absolute stability, relative stability and marginal stability. (6)

(b) Determine the stability of the system using Routh Hurwitz criteria.

$S^6 + S^5 + 5S^4 + 3S^3 + 2S^2 - 4S - 8 = 0$ (9)

UNIT - IV

IX (a) Draw Bode plot for the system with transfer functions H(S)=1/(S+30). (8)

(b) Write down the procedure to construct Root Locus for single pole transfer functions. (7)

OR

X (a) Sketch the root locus of the unity feedback system whose open loop transfer function is $G(s) = K / S(S+4)$. (8)

(b) Write short notes on Gain Margin. (7)
