TED (15/19)4211
(Revision – 2015/19)

1503240210

Reg. No…….
Signature …….

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2024

CONTROL ENGINEERING

[Maximum Marks: **100**] [Time: **3** Hours]

PART-A

[Maximum Marks: **10**]

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

1. Define control system.
2. Define transfer function of a system.
3. Write the Laplace transform of unit step and unit ramp signal.
4. List any two advantages of frequency response analysis.
5. Prepare the first two rows of Routh's array for the characteristic equation:

$s^4 + 8s^3 + 3s^2 + 4s + 1 = 0$ (5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

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

1. Describe linear time invariant and linear time variant system.
2. Find the Laplace transform of the function: f(t) = sin at.
3. Derive an expression for the transfer function of RLC series circuit.
4. State any six block diagram reduction rules.
5. Explain any three standard test inputs used in time response analysis with suitable graph.
6. List the steps to construct root locus.
7. Explain any three frequency domain specifications. (5 x 6 = 30)

PART-C

[Maximum Marks: **60**]

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

UNIT – I

III. a. State and prove initial value theorem. (6)

b. Find the inverse Laplace transform of

$$G(S) = \frac{3}{s^2(S+2)}$$ (9)

OR

IV. a. Compare open loop and closed loop system. (6)

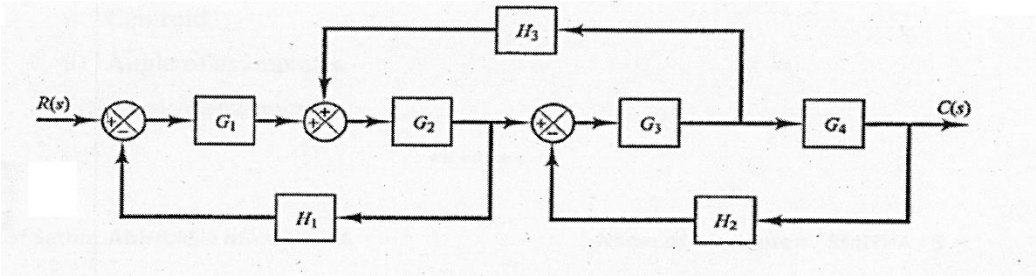
b. Solve the linear differential equation:

$$y'' - 5y' + 6y = 0;\ \ y(0) = 2,\ \ y'(0) = 2$$ (9)

UNIT – II

V. a. Describe Force-voltage analogy. (6)

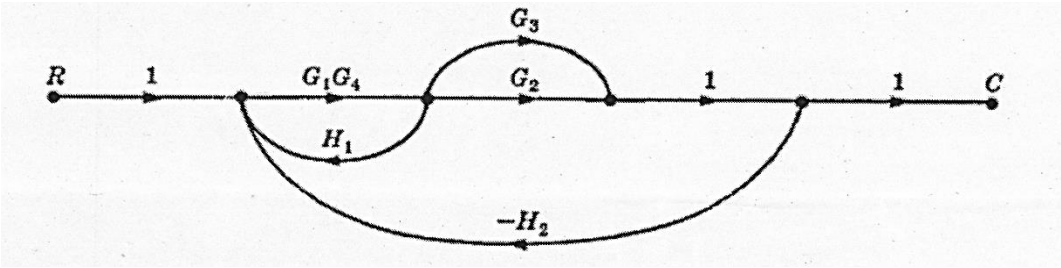
b. Solve the following block diagram using block diagram reduction rules. (9)



OR

VI. a. State and explain Mason's gain formula. (6)

b. Obtain the closed loop transfer function C(s)/R(s) of the signal flow graph by using Mason's gain formula. (9)



UNIT- III

VII. a. Explain the peak time, rise time, settling time and maximum over shoot with the help of a neat diagram. (8)

b. Derive the time response of first order system for unit ramp input. (7)

OR

VIII. a. Explain the steady state error of a closed loop control system. (8)

b. Explain the static error coefficients. (7)

UNIT - IV

IX. Determine the range of values of K for stability of the system whose transfer function is given by:

$$G(s) = \frac{K}{s(s+1)(s+2)}$$ (15)

OR

X. a. Sketch the Bode plot for the transfer function:

$$\frac{C(s)}{R(s)} = \frac{1}{1+Ts}$$ (9)

b. Define the following terms:

(i) Centroid (ii) Angle of asymptotes (iii) Break-away point (6)

****