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

CONTROL ENGINEERING

[Maximum marks: 100] [Time: 3 Hours]

PART – A
Maximum marks: 10

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

1. State final value theorem.
2. Define order of a control system.
3. Define Damping ratio.
4. State the definition of frequency response of a system.
5. Define transfer function. (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 systems with an example.
2. Illustrate poles and zeros of a Transfer function with an example.
3. Explain the step response of first order systems.
4. Describe the bode plot for the transfer function G(S)=Ks.
5. Describe the Laplace transform of e^{at}.
6. Illustrate unit ramp and parabolic test signals.
7. Explain the terms Absolute stability and Relative stability. (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) Compare open loop and closed loop system. (7)

(b) Obtain the inverse Laplace transform of the following transfer function,

$$G(s) = \frac{s+6}{s(s^2+4s+3)}$$ (8)

OR

IV. (a) Derive Laplace transforms of sinat and cosat. (7)

(b) Obtain the solution of differential equation given by

$$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 2x = 0; given\ x(0) = 0, x'(0) = 1.$$ (8)

UNIT - II

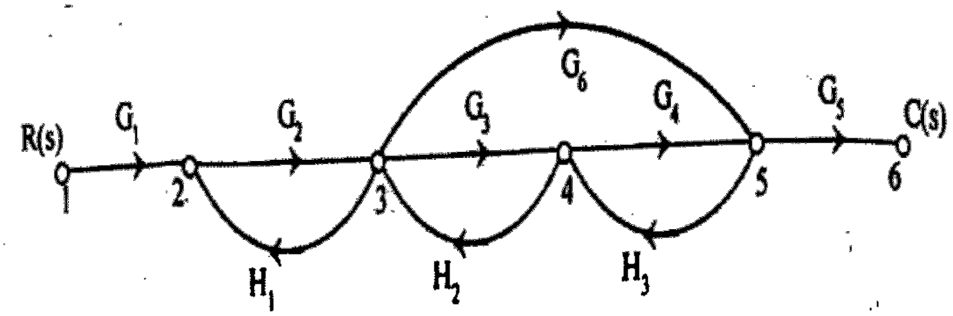
V. (a) Derive the transfer function of mechanical translational systems. (6)

(b) State any six block diagram reduction rules. (9)

OR

VI. (a) Explain force current analogy. (6)

(b) Determine the closed loop transfer function C(s)/R(s) for the signal flow graph given below. (9)



UNIT - III

VII. (a) Describe the impulse response of a first order system. (6)

(b) Explain the following.

(i) Static position error constant
(ii) Static velocity error constant
(iii) Static acceleration error constant (9)

OR

VIII. (a) Describe the transient response specifications with a neat figure. (7)

(b) Derive the expression for static error in terms of Kp, Kv, Ka for a type 1 system subjected to unit step and ramp inputs. (8)

UNIT – IV

IX. (a) Use the Routh stability criterion to determine the location of roots on the s-plane and hence the stability for the system represented by the characteristic equation $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$ (8)

(b) Explain Gain margin and Phase margin. (7)

OR

X. (a) Explain the procedure for constructing root locus. (9)

(b) With necessary steps draw the bode plot of the function G(s)=1+sT. (6)
