



ii) Derive the transfer function of a field controlled DC motor. (7)

(OR)

b) Find the closed transfer function  $C(S)/R(S)$  of the system represented by the block diagram shown in figure (2) using Mason's gain formula.

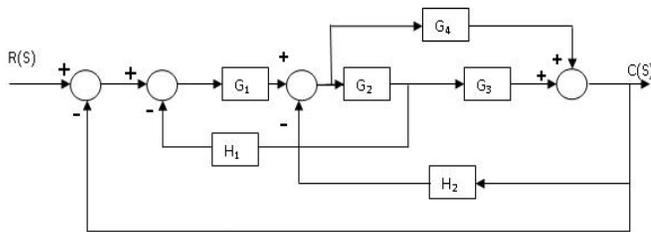


figure (2)

22. a) Derive an expression for time response of a first order system when subjected to unit step and unit impulse inputs.

(OR)

b) i) A feedback control system is described as (7)

$G(S) = \frac{50/S}{(S+2)(S+5)}$ ,  $H(S) = 1/S$  For a unit step input, determine the steady state error constants & errors.

ii) The closed loop transfer function of a unity feedback control system is given by  $C(S)/R(S) = 10/(S^2+4S+5)$ . Determine (i) Damping ratio (ii) Natural undamped frequency (iii) Percentage peak overshoot. (7)

23. a) Draw the Bode Plot for a system having  $G(S)H(S) = \frac{100}{S(S+1)(S+2)}$ . Find

(a) Gain Margin (b) Phase Margin

(OR)

b) The open loop transfer function of a unity feedback system is

$G(S) = \frac{1}{S(1+S)(1+2S)}$  Sketch the Polar plot and determine the Gain margin and

Phase margin.

24. a) Use Routh Hurwitz criterion to investigate how many roots does each of the following polynomials have in the right half of the s-plane?

(i)  $S^4+2S^3+4S^2+8S+15=0$

(ii)  $S^6+4S^5+11S^4+12S^3+26S^2+84S+16=0$

(OR)

b) Sketch the root locus of a unity feedback system having open loop transfer function  $G(S) = \frac{K}{S(S+2)(S+4)}$ . Comment of the range of K for stability.

25. a) Design a lead compensator for a unity feedback system having open loop transfer function  $G(S) = \frac{K}{S(S+2)}$  to meet the specifications. (i) The phase margin of the system is  $50^\circ$ , (ii) Steady state error for a unit ramp input  $\leq 1/15$ .

(OR)

b) (i) Explain the design procedure for lag compensation (7)

(ii) Derive the transfer function of a lead compensator. (7)

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