



Attempt any four questions from Q-2 to Q-8

- Q-2 Attempt all questions (14)
- (a) State the comparison between open loop control system and close loop control system. (7)
- (b) What is transfer function? Derive the transfer function of a closed loop control system with usual notations. (7)

- Q-3 Attempt all questions (14)
- (a) What is Laplace transform ? Why do we use laplace transform in control system. Provide the inverse laplace transform of the following functions : (1)  $1/s$  (2)  $1/s+a$  (3)  $1/s-a$  (6)
- (b) Explain any four rules of block diagram reduction technique . (8)

- Q-4 Attempt all questions (14)
- (a) Derive the transfer function of the following block diagram systems. (7)

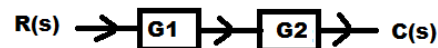


Fig (a)

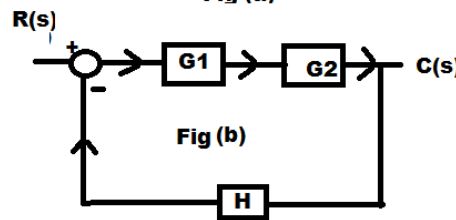


Fig (b)

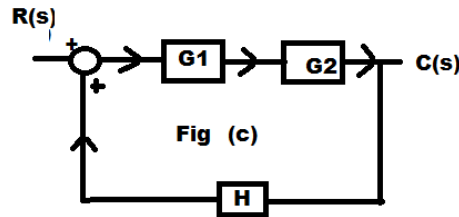


Fig (c)

- (b) Explain the force-voltage and force-current analogy with relative differences and similarities. (7)

- Q-5 Attempt all questions (14)
- (a) Explain the solution steps /rules for signal flow graph. (7)
- (b) Find the transfer function for the block diagram shown in fig. (d) below using signal flow graph solution technique. (7)

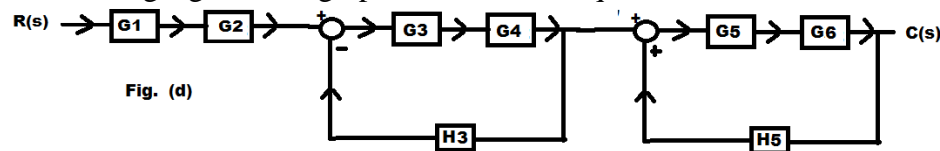


Fig. (d)

- Q-6 Attempt all questions (14)
- (a)  $s^6+2s^5+8s^4+12s^3+20s^2+16s+16 = 0$  check the stability of the given characteristic equation using Routh's method. (7)
- (b) Define the following term : (1)Peak overshoot (2) Peak time (3) Rise Time (4)Delay time (5) Steady state error (6) Transient Response(7) Steady state response (7)

- Q-7 Attempt all questions (14)
- (a) Define controllability and observability for single input single output (7)



- system.
- (b) Derive the root locus for the system having the function (7)  
 $G(s)H(s) = K (S+5)/ S (S^2+2S+1)$

- Q-8 Attempt all questions (14)
- (a) Explain gain margin and phase margin for the case of bode plot. (7)
- (b) Draw the polar plot for the system  $G(s)=1/s(Ts+1)$  (7)

