Exam.Code:0934
Sub. Code: 6663

2053

B.E. (Electrical and Electronics Engineering)

Fourth Semester

PC-403: Control Engineering - I

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Assume any missing data.*

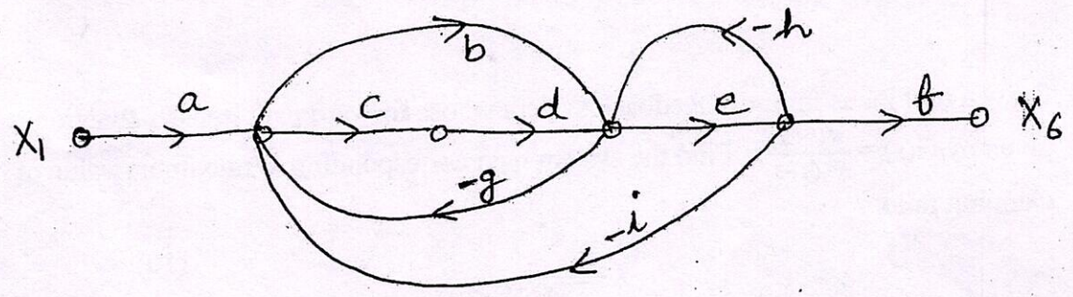
x-x-x

1. (a) Explain servomechanism.
   (b) Differentiate between relative and absolute stability.
   (c) Write torque-voltage analogy.
   (d) Why do we generally choose decade system for Bode Plot?
   (e) Explain significance of breakaway point in Root Locus.

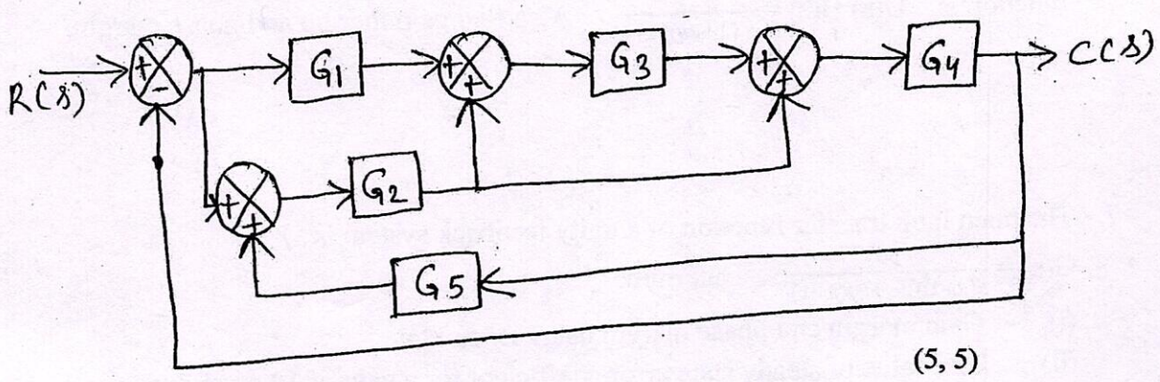
(5 * 2)

PART-A

2. (a) Determine the gain X_6/X_1 using signal flow graph method.



(b) Determine transfer function for the following system using block diagram reduction method:



(5, 5)

P.T.O.

3. (a) Explain all time domain specifications with neat and clean diagram.

   (b) Determine position, velocity and acceleration error constants for a unity feedback control system whose open loop transfer function is:
   $G(s) = \frac{K}{s(s+4)(s+10)}$. If K = 400, determine steady state error for a unit ramp input.

   (5, 5)

4. (a) The open loop transfer function of a unity feedback system is
   $G(s)\,H(s) = \frac{K}{s(1+Ts)}$. It is desired that all roots of the characteristic equation must lie in the region to the left of the line s = "-a". Determine values of K and T required so that there are no roots on the right of line s = "-a".

   (b) Discuss speed control of DC motor.

   (5, 5)

PART-B

5. Draw a root locus for unity feedback system whose forward path transfer function is given by $G(s) = \frac{K(s+1)}{s^2(s+5)}$. Find the system gain corresponding to maximum value of damping ratio.

   (10)

6. Comment on stability of the system using Nyquist Plot whose open loop transfer function is $G(s)\,H(s) = \frac{1}{s(1+2s)(1+s)}$. Also find gain margin and phase margin.

   (10)

7. The open loop transfer function of a unity feedback system is
   $G(s) = \frac{50}{s(s+10)(s+5)(s+1)}$. Determine
   (i) Gain margin and phase margin using Bode Plot.
   (ii) The value of steady state error coefficient for a gain of 10 db and value which will make the closed loop system marginally stable.

   (10)

x-x-x