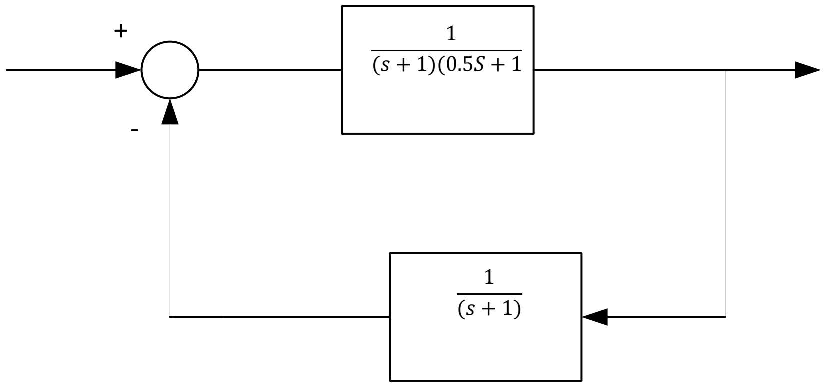
RGPV BASED ASSIGNMET QUESTION.

SUBJECT- CONTROL SYSTEM (EC-502)

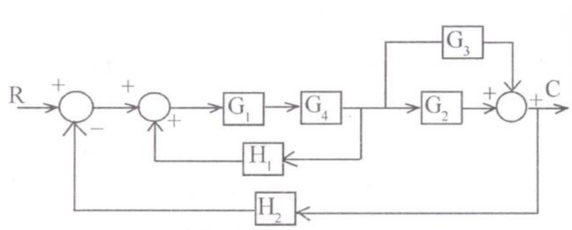
BRANCH- EC 5TH SEM

INTRUCTIONS. 1. All questions with their solution are submitted till 27 October 2014.

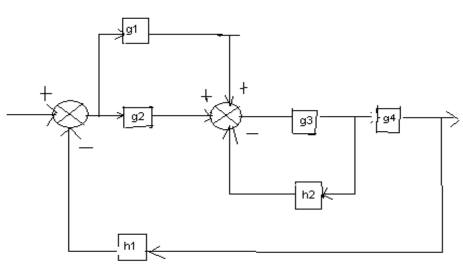
1. Determine the overall transfer function of the following closed loop control system.



2. Draw the signal flow graph for the following feedback control system.



3. Determine the T.F C(S)/R(S) for the block diagram shown in fig by reduction method and signal flow graph?



3. Determine the graph determinant for the block diagram by Mason gain formula

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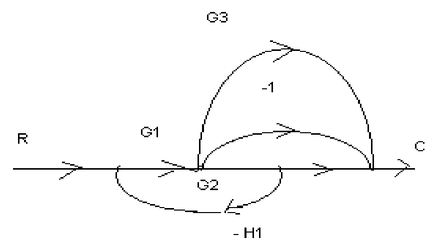
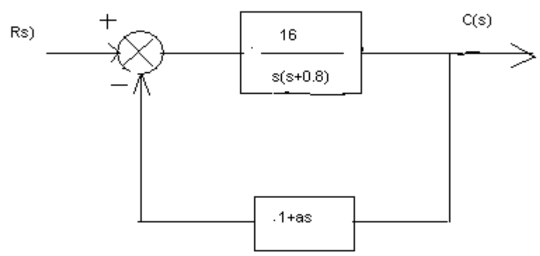


4. For the system shown in fig, determine the value of a such that the damping ratio is 0.5.Calculate the values of peak time ,setteling,rise time and maximum over shoot.Input R(s) in



unit step.

5. Define and explain the term absolute stability and relative stability .A unity feedback control system

is characterized by the open loop transfer function.

$$G(s) = \frac{k(s+13)}{s(s+3)(s+7)}$$

Using routhhurwits criteria of stability , calculate the range of values of K for the system to be stable.

6. Explain the terms (1) Asymptotes (2) Centroid (3) Break away points (4) Poles (5) Zeros

And Sketch complete root locus of

$$G(s)H(s) = \frac{k}{S^2(s+2)(s + 8s+20)}$$

as k varies from o to infinity and show calculation of all important points.

7. Construct the Bode plote for the system whose open loop transfer function is given by:

$$G(s)H(s) = \frac{30}{s(1+0.5s)(1+0.08s)}$$

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Determine the gain margine and phase margine.

8. Draw the complete Nyquist plot for the system consider T.F and determine the stability of the closed loop system $G(s)H(s) = \frac{60}{(s+1)(S+2)(s+5)}$

9. Draw the Bode plot for the T.F

$$G(S) = \frac{50}{s(1+0.25s)(1+0.1s)}$$

from the graph determine
Gain crossover frequency, phase crossover frequency , G.M and P.M **and**Stability of the System

10. A unity feedback control system has an open loop T.F of G(s) = $\frac{1}{s^2}$ Design a suitable compensating network such that a phase margin of 45^0 achieved without sacrificing system velocity error constant.

11. Solve the difference equation

$$c(k+2) + 3c(k+1) + 2c(k) = u(k)$$

$$c(0) = 1, \quad c(k) = 0 \;\; for\; k < 0$$

$$c(1) need\ in\ the\ soluation\ can\ be\ obtained\ by\ k = -1$$

$$c(1) + 3c(0) + 2c(-1) = u(-1)\ or\ c(1) = -3$$

12. Find the inverse z- transform of $\frac{4z^2-2z}{z^3-5z^2+8z-4}$.

13. Define the of the system .Test the observability of the system.

$$\begin{bmatrix} \dot{x}1 \\ \dot{x}2 \\ \dot{x}3 \end{bmatrix} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \\ x3 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u$$

$$\begin{bmatrix} \dot{y} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x$$

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a) State and explain Nyquist stability Criterion. Using Nyquist Criterion determine whether the following system is stable or not?

$$G(s)\,H(s) = \frac{1+4s}{s^2(1+s)(1+2s)}$$

b) A unity feedback system has the following open-loop frequency response.

ω	2	3	4	5	6	8	10
$\lvert G(j\omega) \rvert$	7.5	4.8	3.15	2.25	1.70	1.00	0.64
$\angle G(j\omega)$	−118	−130	−140	−150	−157	−170	−180

Evaluate the gain margin and phase margin of the system.