



Name:

ID. No. :

Signature:

Q₁

For the unity feedback system $G(s)=25 / K s^2(s+2)$, find :

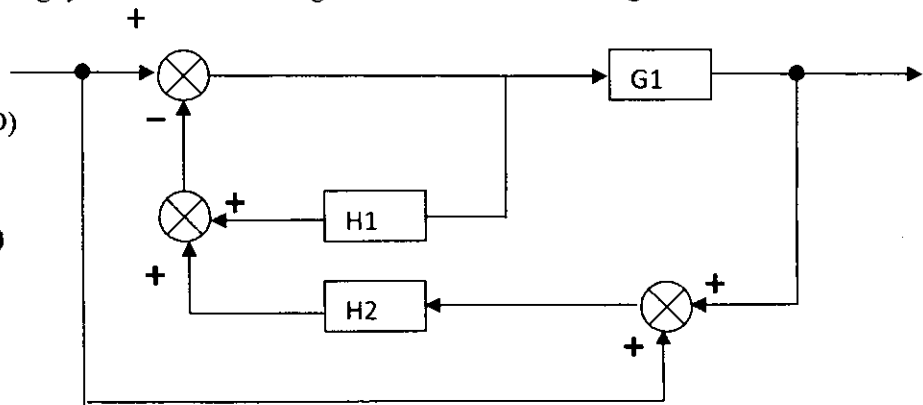
1. K value where the damping ratio equal to (0.5)? 5(Deg.)
2. t_p, t_r, t_s for (2% error) , and M_p ? 5(Deg.)
3. if $G(s)=k/s(s+n)$. determine k and n such that the response for the input $R(s)=1$ has form: $c(t)=ce^{-t}\sin(2t+\alpha)$?and evaluate c and α when all initial condition are zero? 5(Deg.)

Q₂

a: Find T.F. from the following system with block diagram reduction and Mison gain formula ? 10(Deg.)

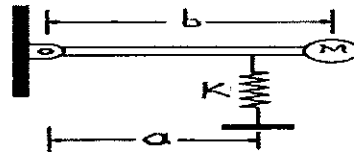
b: prove that: 5(Deg)

1. $e(t)=r(t)/1+G(D)H(D)$
 $k_p = \lim_{s \rightarrow 0} G(s)H(s)$
 $k_v = \lim_{s \rightarrow 0} sG(s)H(s)$
 $k_a = \lim_{s \rightarrow 0} s^2G(s)H(s)$



Q₃

- a) Find natural frequency for the system shown : 8(Deg)
- b) Find natural frequency when $a=b$? 7(Deg)



Q₄

a : the characteristic equation for a control systems are:

$$S^3 + S^2 - S - 1 = 0$$

$$S^4 + 5S^3 + 5S^2 - 5S - 6 = 0$$

$$S^3 + 6S^2 + 13S + 78 = 0$$

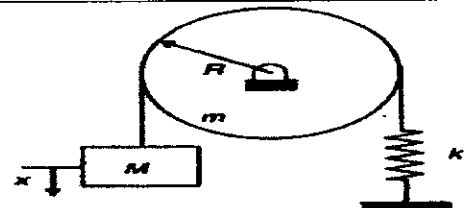
use Routh's criterion to determine which the system is stable ? 5(Deg.)

b: for a unity feedback control system $G(s)=k/ s(s^2+12s+45)$ sketch the root-locus plot? 5(Deg.)

c: for each of functions shown sketch polar plot when the frequency equal to 16,8,4,2, and 1 ? 5(Deg)
 $G(s)=10/(1+0.25s)$ $G(s)=10/s(1+0.25s)$ $G(s)=10/(1+0.25s)^2$

Q₅

- a) Determine the natural frequency for the system shown ? 8(Deg)
- b) Determine the natural frequency when another spring is added beside the presence original system spring ??(Deg)



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