Q.P. Code : **3559**

(3 Hours) [Total Marks : 80

N.B. : (1) Question **No.1** is **Compulsory**
(2) Solve any **three** questions from remaining **five** questions.
(3) Assume suitable data if necessary.

1. Attempt any four. 20
   (a) Compare between open loop and closed loop system.
   (b) Derive the transfer function of simple closed loop system.
   (c) Explain relative stability analysis.
   (d) Sketch the nature of polar plot asymtotically for the open loop transfer
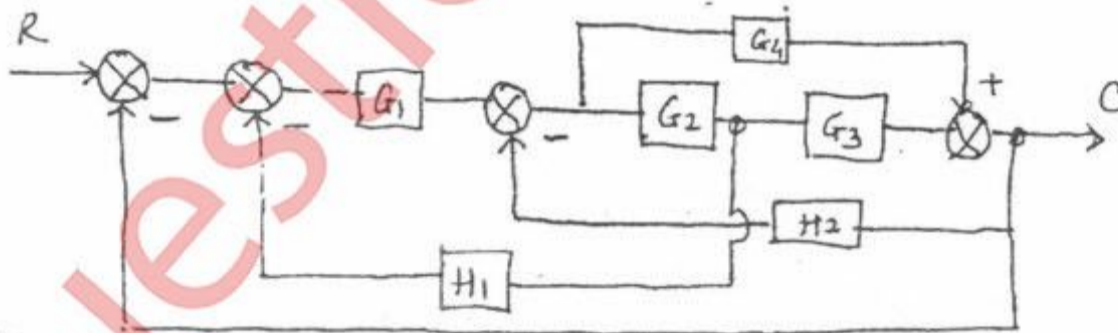   function $G(S) = \dfrac{1}{S(S+2)}$
   (e) Derive the steady state error.

2. (a) Sketch the complete root locus for the following system having 10
   $$G(S)\ H(S) = \dfrac{k(s+5)}{s^2 + 4s + 20}$$
   (b) Derive the unit step response of second order underdamped system. 10

3. (a) Sketch the signal flow graph of following block diagram. By using 10
   Mason's Gain formula find the transfer function of it.

   (b) Draw a bode diagram of open loop transfer function G(S) Determine 10
   GM, PM, Wgc, Wpc.
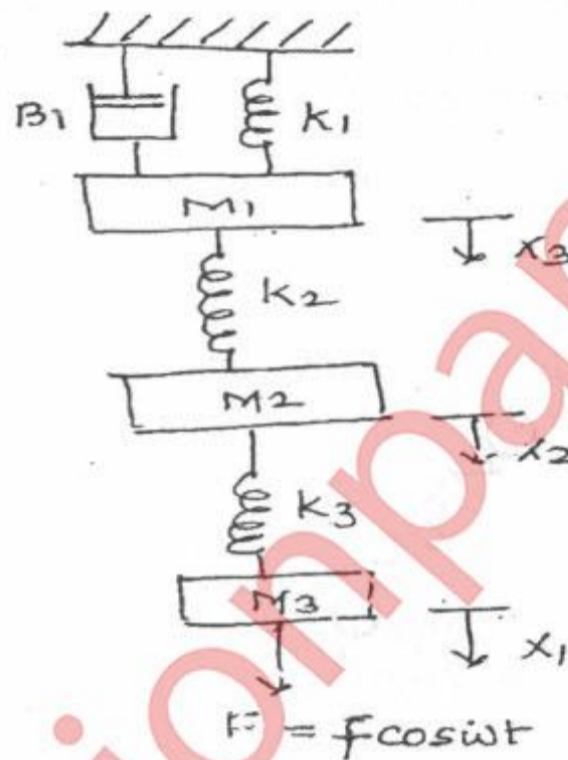 $$G(S) = \dfrac{800(S+2)}{S^2(S+10)(S+40)}$$

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4. (a) Determine the stability of following open loop transfer function using Nyquist stability. **10**

$$G(s)\,H(s) = \frac{K(S+3)}{S(S-1)}$$

(b) Draw the analogous electrical network based on (a) F-V (b) F-I **10**

5. (a) The open loop transfer function of unity feed back system is **10**
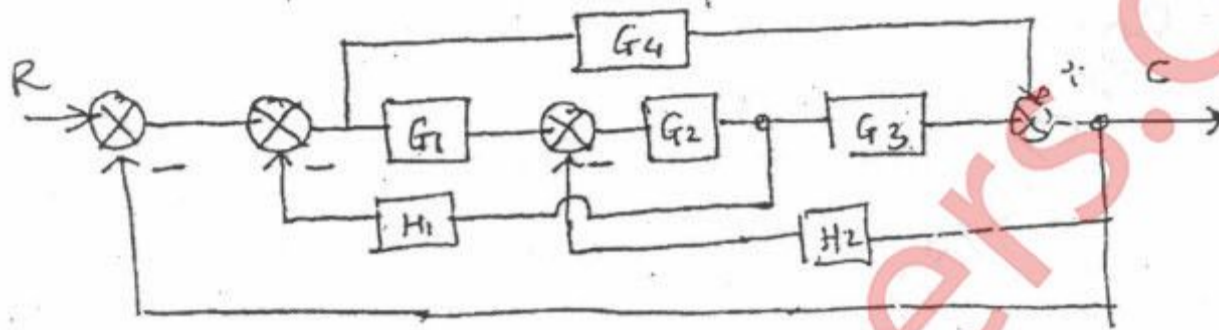
$G(S)\,\dfrac{K}{S(1+Ts)}$. For the system overshoot reduces from 0.6 to 0.2 due to

change in K only. Show that $\dfrac{Tk_1 - 1}{Tk_2 - 1} = 43.33$ where K_1 and K_2 are
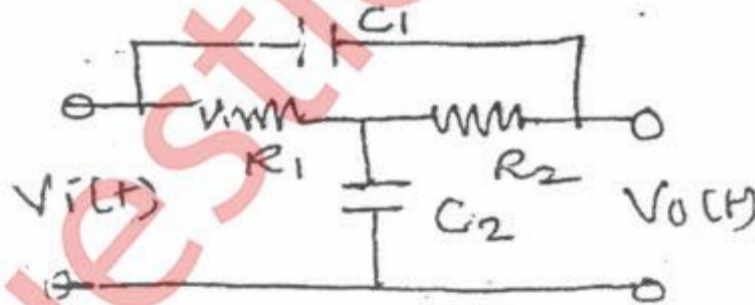
values of K for 0.6 to 0.2

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(b) Use a block diagram reduction rules to obtain the transfer function of the block diagram shown below.   10

6. Solve the following.   20

    (a) For a system with characteristic equation ,
$$F(s) = S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2 = 0$$
examine stability.

    (b) Write the short note on standard signals.

    (c) Find the transfer function of following.

    (d) What are the advantages and features of transfer function.

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