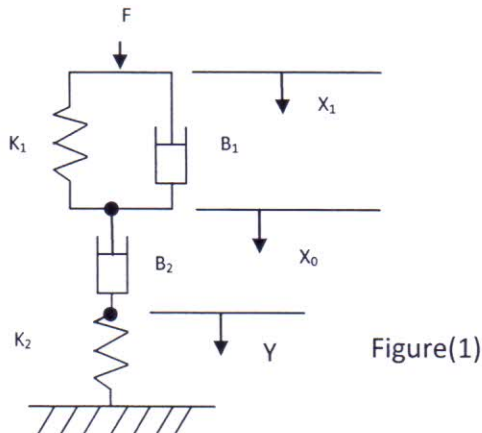




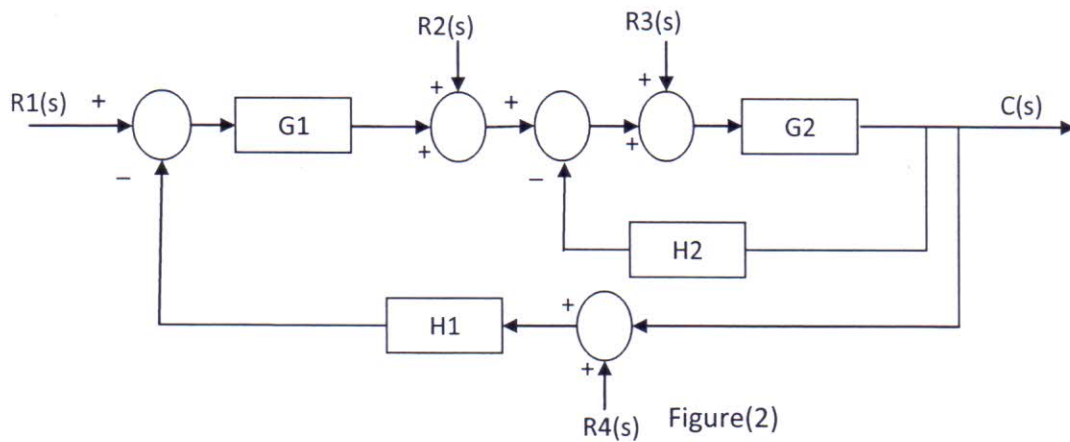
ملاحظة: مرفق ورق رسم بياني لوغاريتمي مع ورق الاسئلة .

Q1:(10 points) The system shown in the figure (1) . Draw the analogues electrical circuit, use $f-v$ analogy, Then Find transfer Function $\frac{X_0(s)}{X_1(s)}$

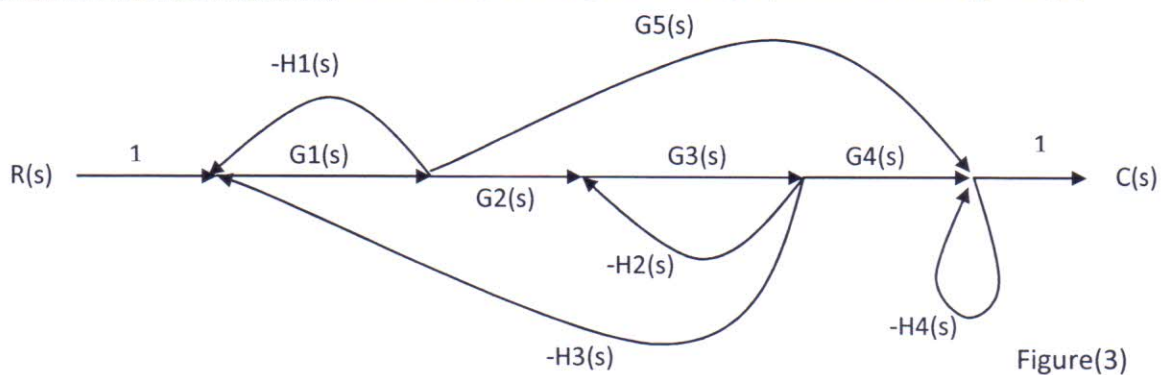


Q2:(10 points)

a) Find the total transfer function $\frac{C(s)}{R(s)}$, using block reduction technique in Figure(2)

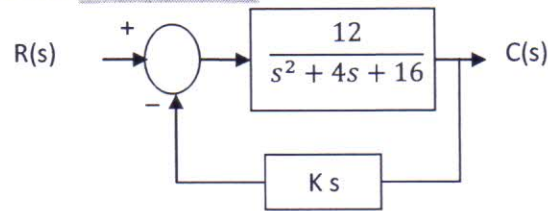


b) Draw the Block Diagram from the given signal flow graph shown in figure (3)



Q3: (8 points) Consider the system shown in figure (4), when the damping factor $\zeta = 0.8$

- Determine the overshoot of the system.
- Determine the value of (K).



Figure(4)

Q4: (12 points) The open loop transfer function of a unity feedback system is given by :

$$G(s) = \frac{108}{s^2(s+4)(s^2+3s+12)}$$

Determine the steady state error of the system. When the input is given by :
 $r(t) = 2 + 5t + 2t^2$

Q5: (10 points) A feedback system has an open loop transfer function:

$$G(s)H(s) = \frac{k(1-s)}{s(s^2+5s+9)}$$

Determine the maximum value of k for the closed loop system to be stable.

Q6: (10 points) Draw the bode plot for the transfer function below :

$$G(s) = \frac{31.6(1+s)(5+s)}{s(2+s)(8+s)(10+s)}$$

From the graph determine:

- Phase crossover frequency
- Gain crossover frequency
- P.M , G.M
- Stability of the system

NOTES: $\frac{1}{s \pm a} \xleftrightarrow{\mathcal{L}} e^{\mp at}$, $u(t) \xleftrightarrow{\mathcal{L}} \frac{1}{s}$, $\frac{t^{n-1}}{(n-1)!} \xleftrightarrow{\mathcal{L}} \frac{1}{s^n}$