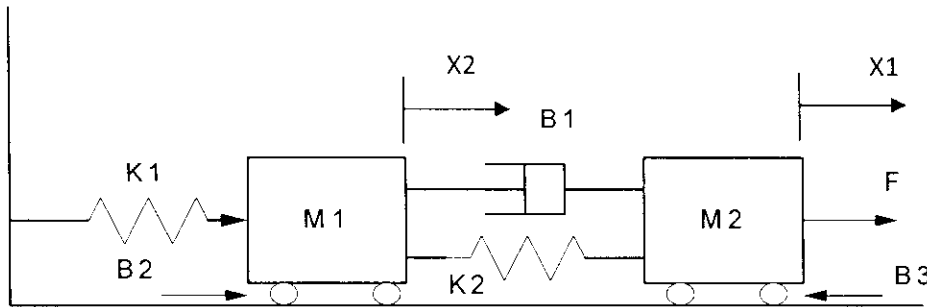


ملاحظة: مرفق ورق رسم بياني لوغاريتمي مع ورق الاسئلة .

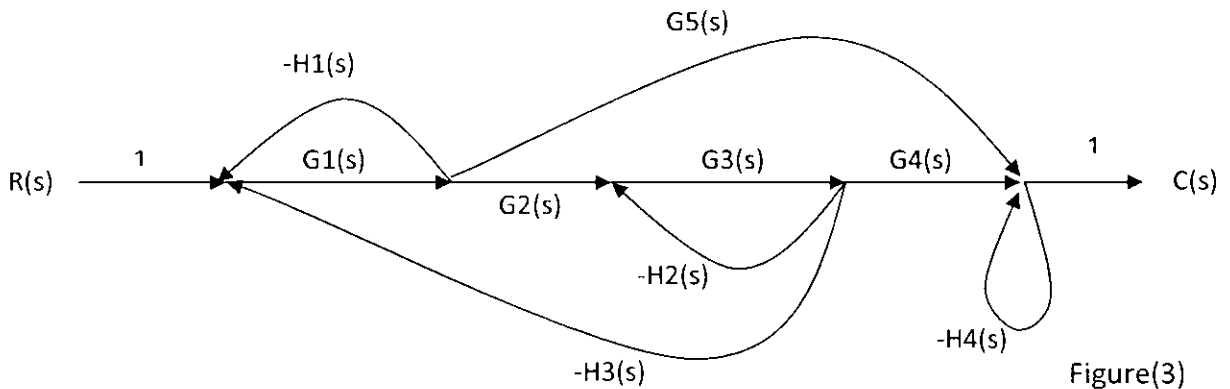
Q1:(12 points)

a) For the system shown in the figure (1) . Draw the analogues electrical circuit, use $f-i$ analogy.



Figure(1)

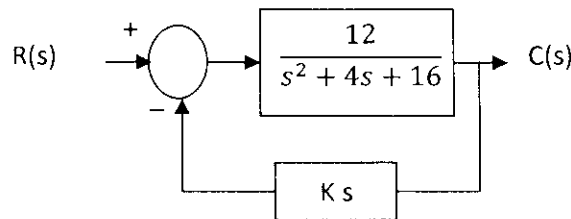
b) Draw the Block Diagram from the given signal flow graph shown in figure (3) Then Find Transfer Function $C(s)/R(s)$



Figure(3)

Q2: (12 points) Consider the system shown in figuer (4),when the damping factor $\zeta = 0.8$

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



Figure(4)

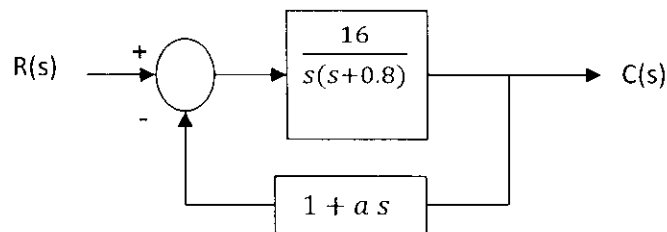
Q3: **(12 points)** A unity feedback control system is characterized by open loop transfer function. $G(s) = \frac{20}{s(s+2)(s^2+2s+20)}$

Determine the steady state error of the system. When the input is (5t).

Q4: **(12 points)**

Consider the system as shown in figure(4).

- Determine the value of (a) such that damping ratio is 0.5
- Obtain the values of rise time t_r and maximum overshoot M_p in its step response



Figure(4)

Q5: **(12 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: $\frac{1}{s \pm a} \xleftrightarrow{\mathcal{L}} e^{\mp at}$, $u(t) \xleftrightarrow{\mathcal{L}} \frac{1}{s}$, $\frac{t^{n-1}}{(n-1)!} \xleftrightarrow{\mathcal{L}} \frac{1}{s^n}$