[1-a] Define the following terms :-

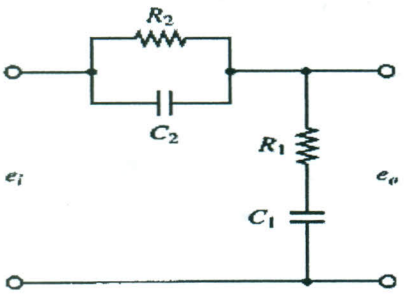
Transfer function. System order. Rise time. Peak time. Delay time.

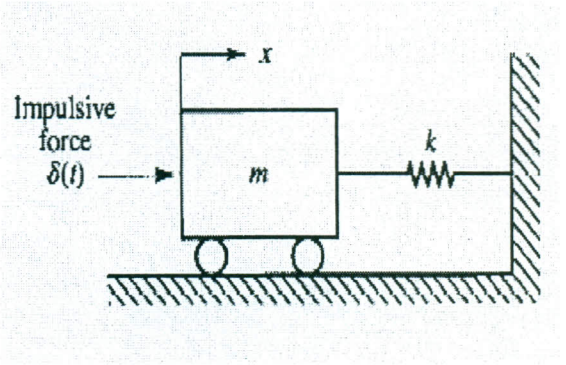
[1-b] A closed loop control system has a forward path gain $G(S)=\frac{10}{S(S+5)}$ **, and the feedback gain** $H(S)=3$**. i- Drive a mathematical expression for the error function E(S).**

ii- find the steady state error if the input signal is $r(t)=t$ **.**

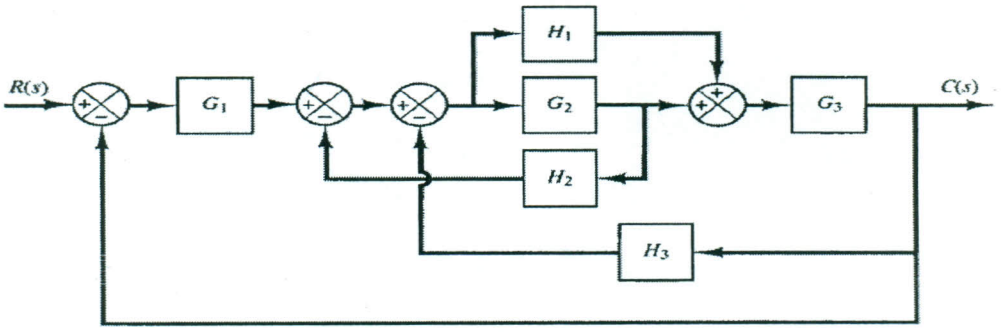
[1-c] Derive the transfer function of the armature controlled dc motor.

[2-a] Obtain the transfer function of the following systems :





[2-b] For the following block diagram sketch the corresponding signal flow graph , then using Mason's gain formula find the overall transfer function .



[3-a] Find the range of K that make the system stable . The system characteristic equation is given by : $S(S^2+S+1)(S+2)+k=0$

[3-b] A control system has a forward path gain $G(S)=\frac{K}{S(S+1)}$**, the feedback gain** $H(S)=(1+K_hS)$**.**

If the maximum overshoot is 0.163 and the delay time is 0.45 sec., find

i- The gain constants K and K_h .

ii- The rise time, the peak time and the settling time.

GOOD LUCK

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