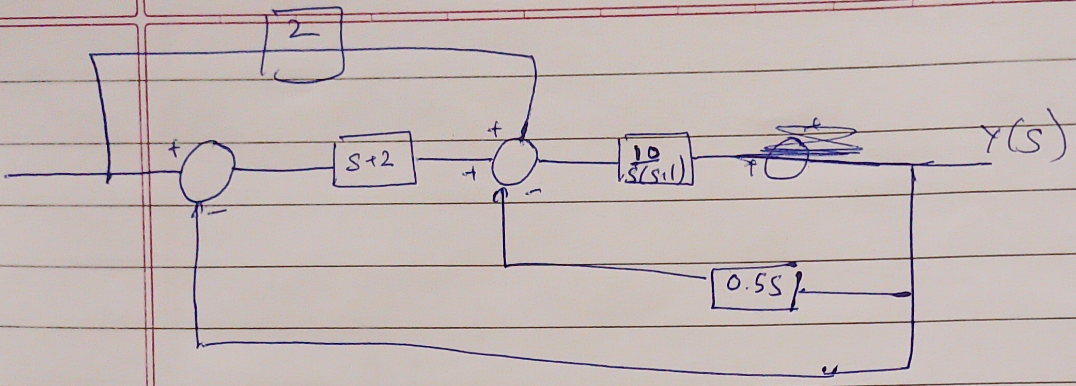
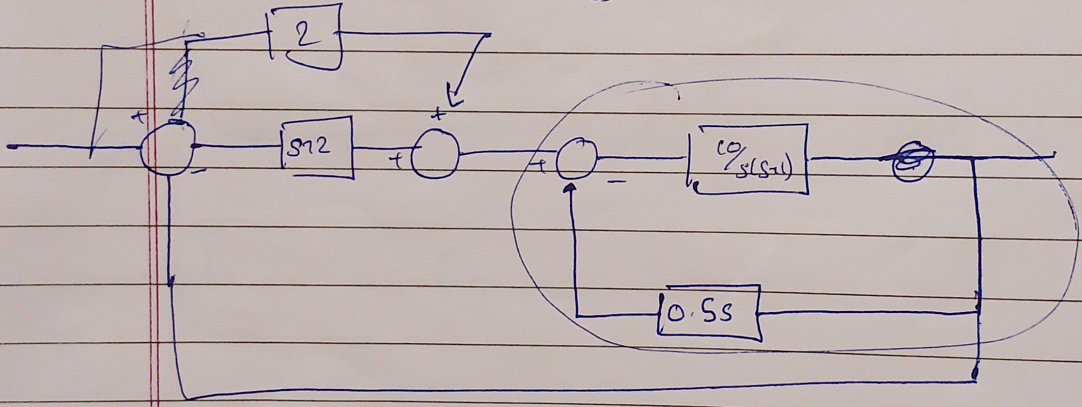
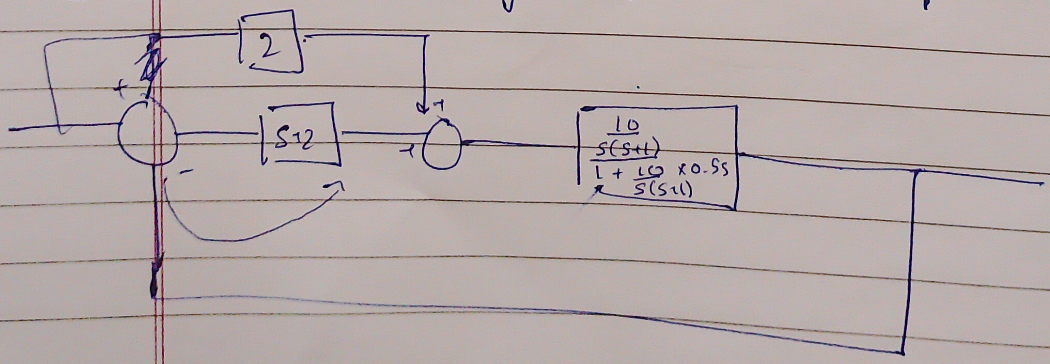


① ~~P3~~ First we split the triple adder in two adders

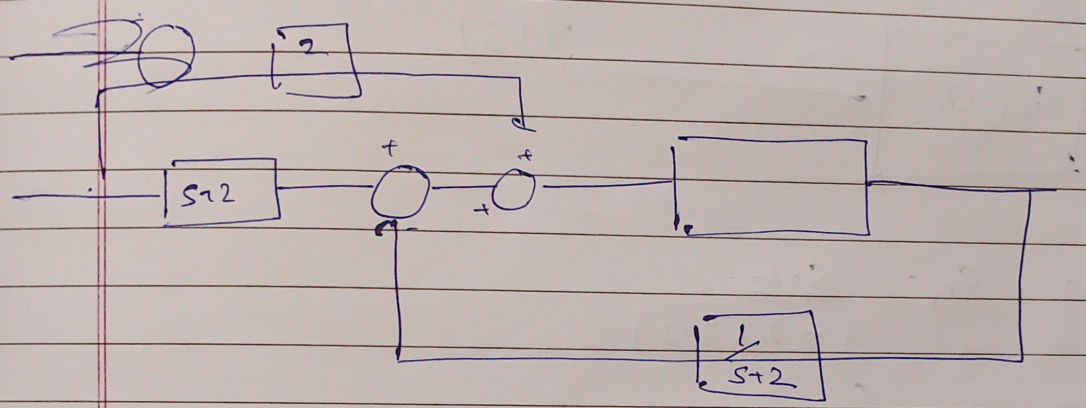


$$\frac{\frac{10}{s(s+1)}}{1+\frac{10}{s(s+1)}0.5s}$$

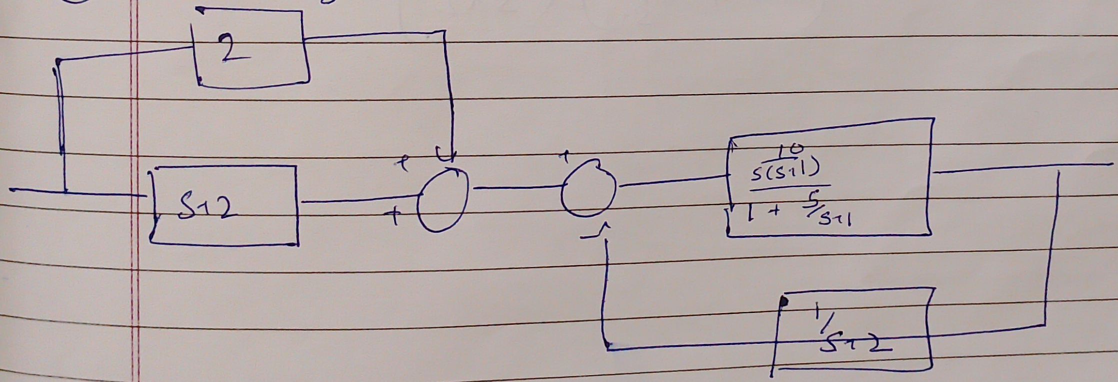
② Simplify ~~Solve~~ the rigth feedback loop.



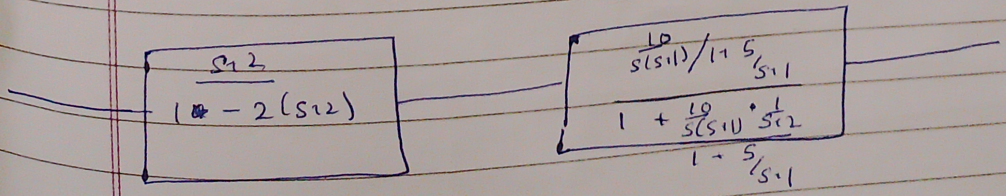
(3) Shift the left adder ~~to~~ after the block



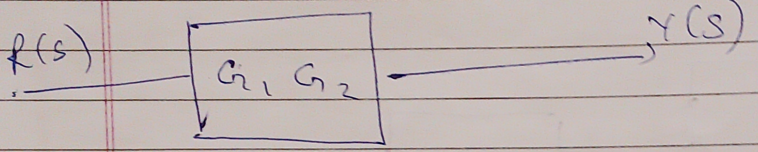
(4) Exchange the two adders



(5) Simplifying the feed back loops we get



(6) Finally adding both the blocks we get :

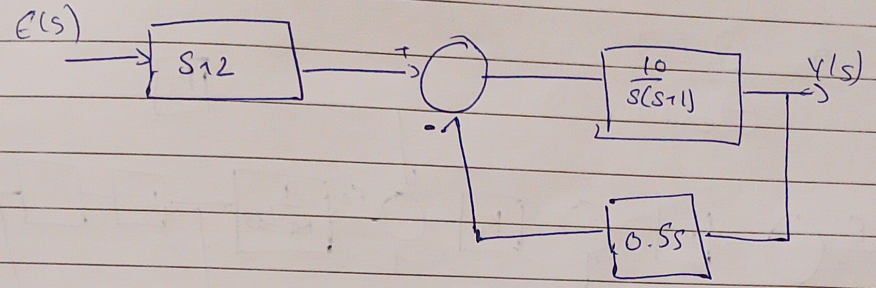


where, $G_1 = \dfrac{s+2}{1-2(s+2)}$

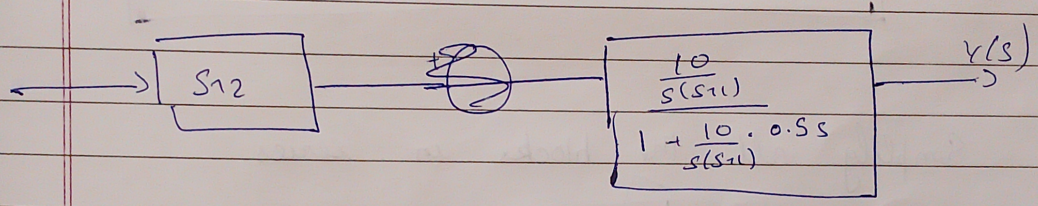
$$G_2 = \frac{\left(\frac{10}{s(s+1)} \Big/ 1+\frac{s}{s+1}\right)}{1+\left(\frac{10}{s(s+1)} \Big/ 1+\frac{s}{s+1}\right)\left(\frac{1}{s+2}\right)}$$

(b) $\left.\dfrac{Y(s)}{E(s)}\right|_{N=0}$

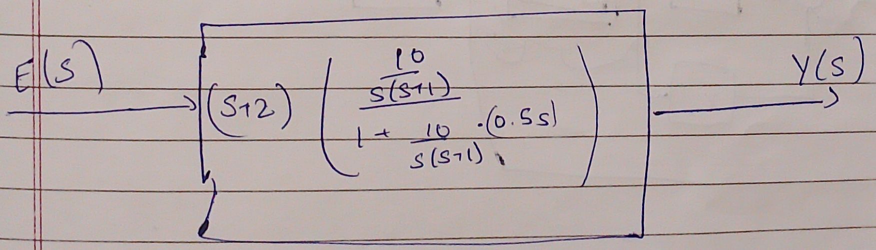
(b)



(1) Simplifying the feed back a loop we get:



(2) Add the two boxes



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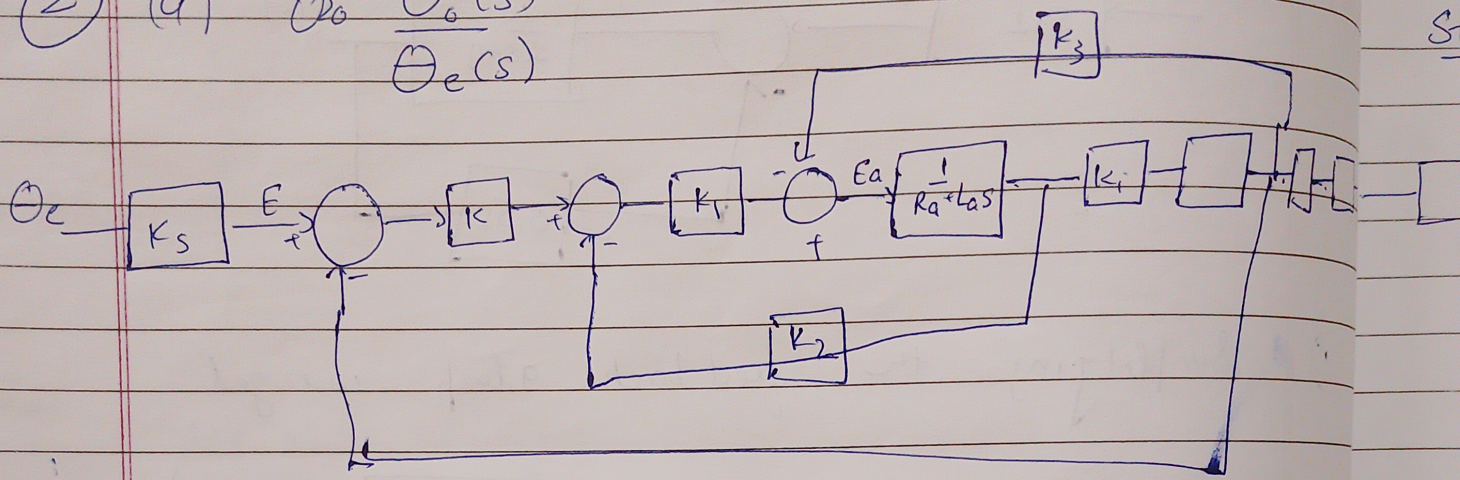
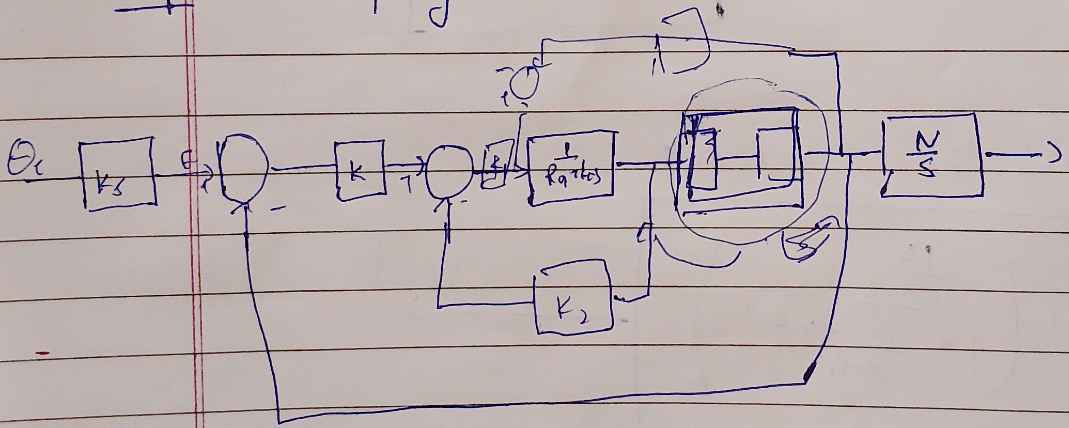
Page No:

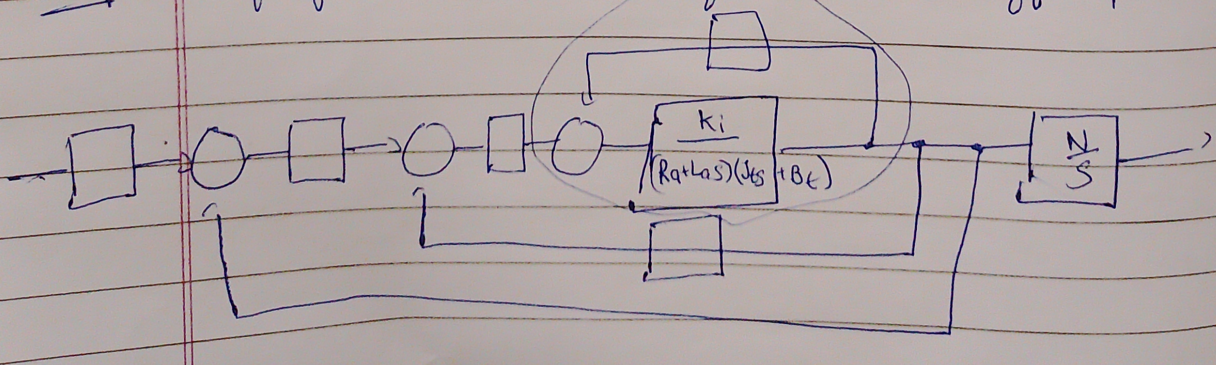
(2) (a) θ_0 $\dfrac{\theta_o(s)}{\theta_e(s)}$



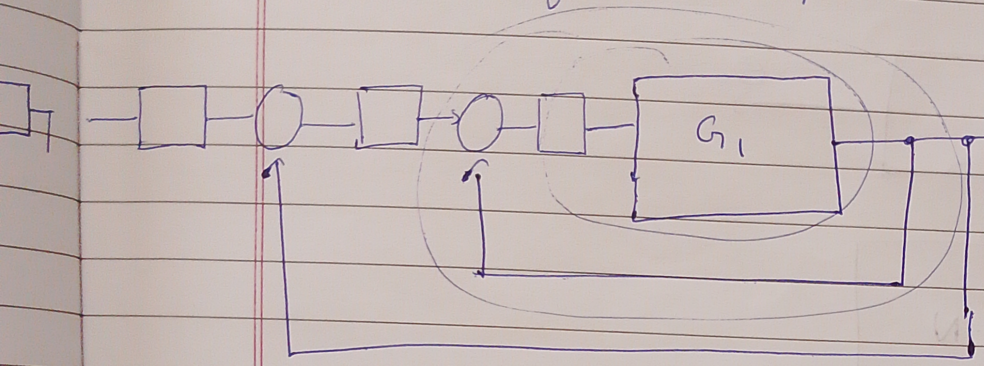
Step1 Simplify all the blocks in series



Step2 Shifting the block before take off point

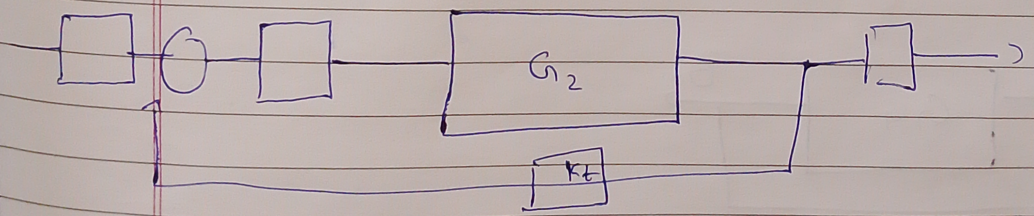


Step3 Solve the feeback loop



$$G_1 = \frac{\frac{K_i}{(R_a+L_as)(J_ts+B_t)}}{1 + \frac{K_i \cdot K_3}{(R_a+L_as)(J_ts+B_t)}}$$

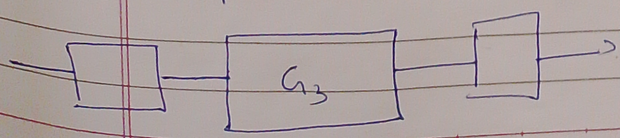
Step4 Adding the blocks in series and then solving the feed back loop



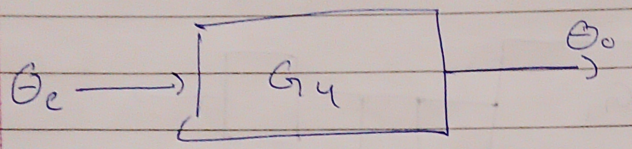
$$G_2 = \frac{G_1 \cdot K_1}{1 + G_1 K_1 \cdot K_2}$$

Step5 Solve the blocks in series and then the feedback loop.

$$G_3 = \frac{G_2 \cdot K}{1 + G_2 \cancel{\cdot} K_t}$$



Step6 ST7 8 Add the blocks in series :

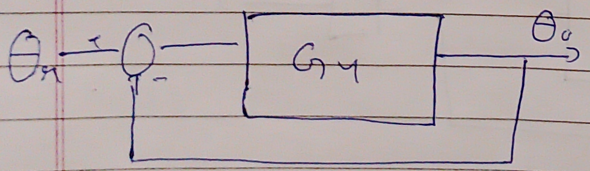


$$\boxed{G_4 = G_3 \cdot K_5 \cdot N}$$

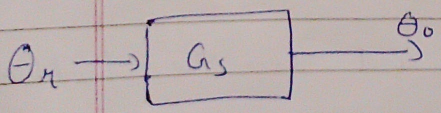
(b) $\frac{\theta_o(s)}{\theta_r(s)}$

→ In part (a) we calculated $\frac{\theta_o(s)}{\theta_e(s)} = G_4 = G_3 \cdot K_5 \cdot N$

We will take help of this.



Solving this feed back loop we get



$$\boxed{G_5 = \frac{G_4}{1 + G_4^2}}$$