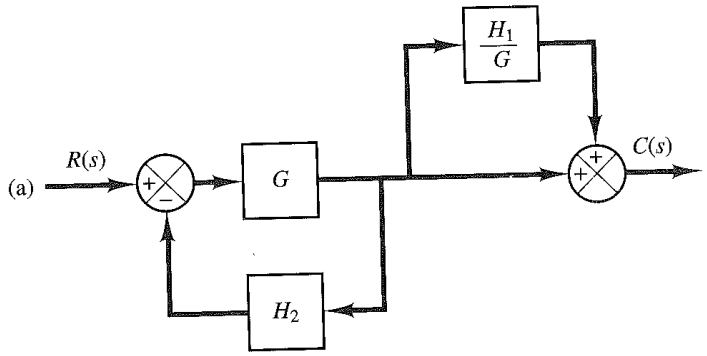
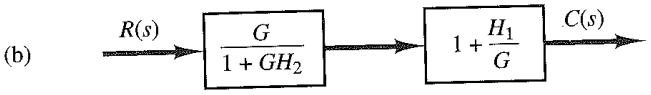
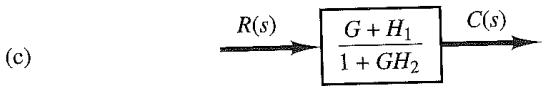
1-01-c – Tutorial Solution- System Block Diagrams

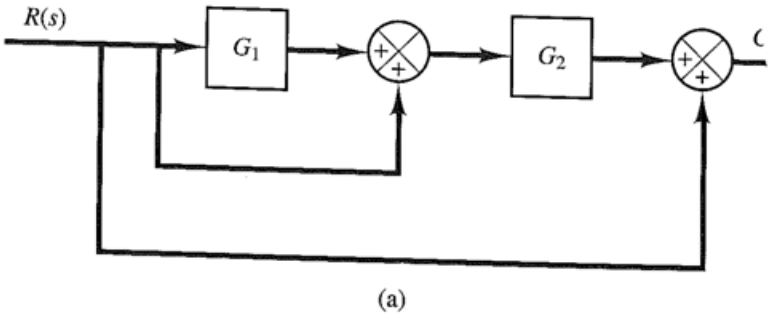
Q1

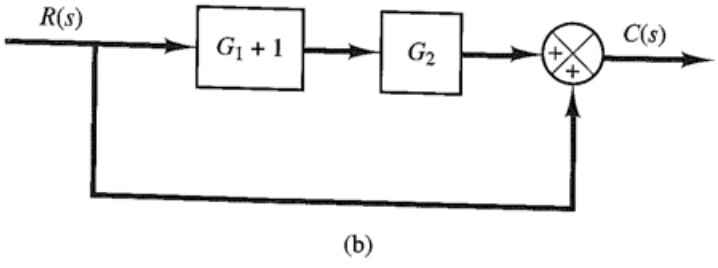


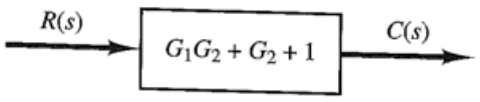




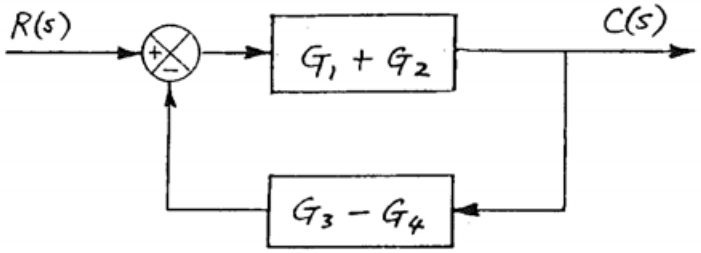
Q2





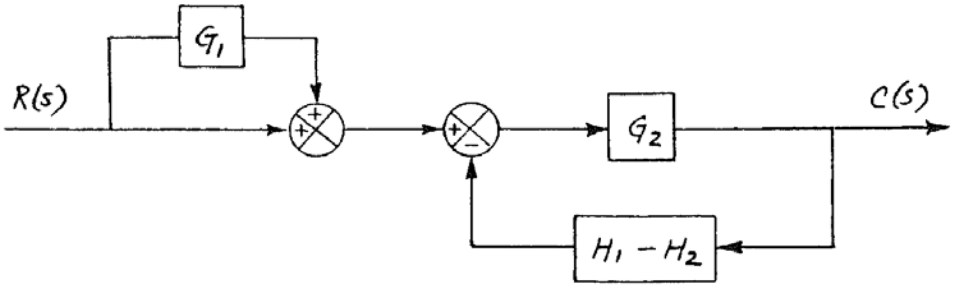


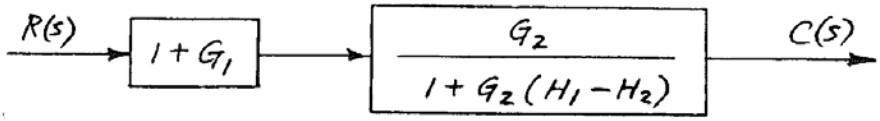
Q3



$$\frac{C(s)}{R(s)} = \frac{G_1 + G_2}{1+(G_1+G_2)(G_3-G_4)}$$

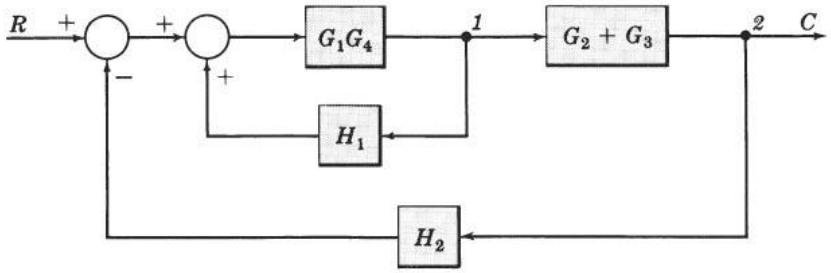
Q4



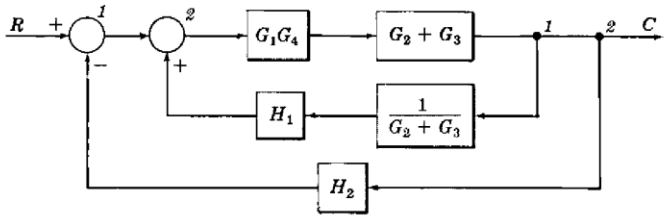


$$\frac{C(s)}{R(s)} = \frac{(1+G_1)G_2}{1+G_2(H_1-H_2)}$$

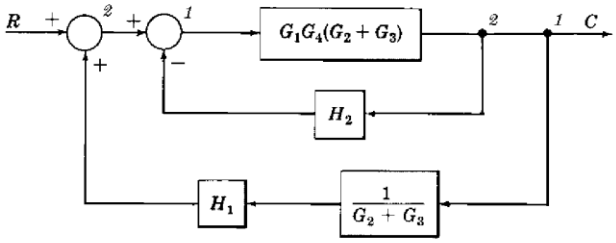
Q5 (ex 7-10 Schaum's) step 1 & 2



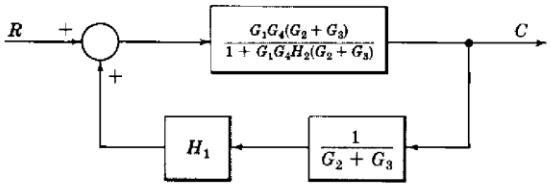
We do not apply Step 3 at this time, but go directly to Step 4, moving takeoff point *1* beyond block $G_2 + G_3$:



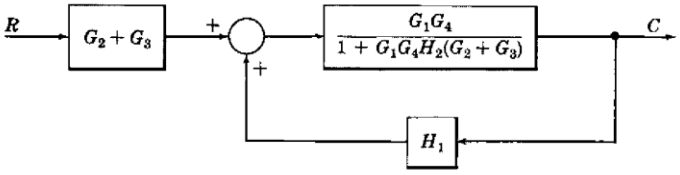
We may now rearrange summing points *1* and *2* and combine the cascade blocks in the forward loop using Transformation 6, then Transformation 1:



Step 3:



Finally, we apply Transformation 5 to remove $1/(G_2 + G_3)$ from the feedback loop:



Note that the same result could have been obtained after applying Step 2 by moving takeoff point *2 ahead* of $G_2 + G_3$, instead of takeoff point *1 beyond* $G_2 + G_3$. Block $G_2 + G_3$ has the same effect on the control ratio C/R whether it directly follows R or directly precedes C.