BLOCK DIAGRAM ALGEBRA, LABORATORY 3
ECE 425 | ME 4203
BLOCK DIAGRAM 1
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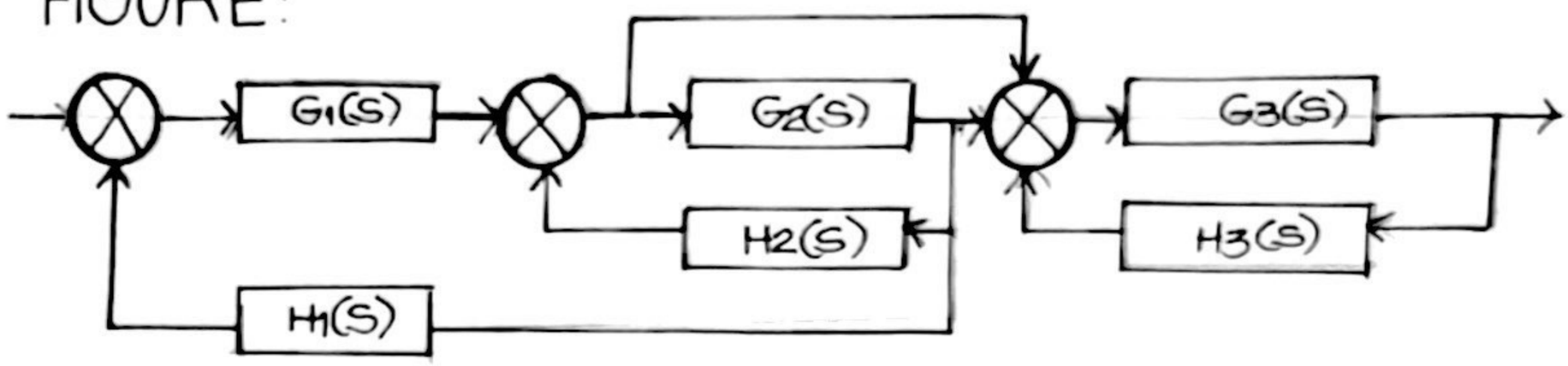
FIGURE:



GIVEN:

$G_1(S) = 1/S^2$ $\quad H_1(S) = 1/S$

$G_2(S) = 1/S + 1$ $\quad H_2(S) = 1/(S-1)$

$G_3(S) = 1/S$ $\quad H_3(S) = S-1$

SOLVING =

$$= \frac{G2}{1 + G2\,H2}$$

$$= \frac{[1/(s+1)]}{1 + [(1/s+1)(1/s-1)]}$$

$$= \frac{[1/(s+1)]}{1 + [1/(s^2-1)]}$$

$$= \frac{[1/(s+1)]}{[s^2-1+1]/[s^2-1]}$$

$$= \frac{[1/(s+1)]}{s^2/[s^2-1]}$$

$$= \frac{1}{s+1} \cdot \frac{s^2-1}{s^2}$$

$$= \frac{s^2-1}{s^3+s^2}$$

$$= \frac{1}{G2} + 1$$

$$= 1/[1/s+1] + 1$$

$$= 1 \cdot \frac{s+1}{1} + 1$$

$$= s + 2$$

LABORATORY 3, BLOCK DIAGRAM NO. 1

FOR G3, PARALLEL

$$\frac{= G3}{1 + G3\,H3} = \frac{[1/s]}{1 + [(1/s)(1/s - 2)]}$$

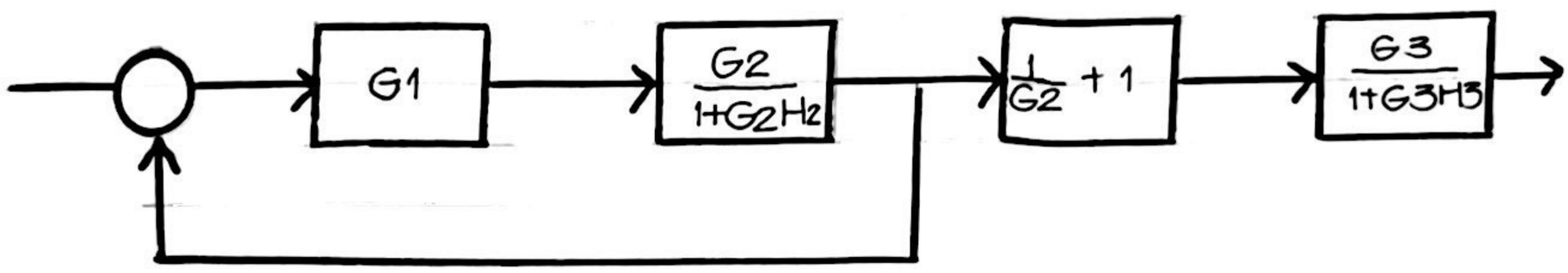
$$= \frac{[1/s]}{1 + [1/(s^2 - 2s)]}$$

$$= \frac{[1/s]}{(s^2 - 2s + 1)/(s^2 - 2s)}$$

$$= \frac{1}{s} \cdot \frac{s^2 - 2s}{s^2 - 2s + 1}$$

$$= \frac{s^2 - 2s}{s^3 - 2s^2 + s}$$

REDUCED DIAGRAM SO FAR



FOR $\cdot\ [(1/G2) + 1] \cdot [G3/(1 + G3H3)]$

$$= \frac{s^2 - 2s}{s^3 - 2s^2 + s} \times (s + 2)$$

$$= \frac{s^3 - 2s^2 + 2s^2 - 4s}{s^3 - 2s^2 + s}$$

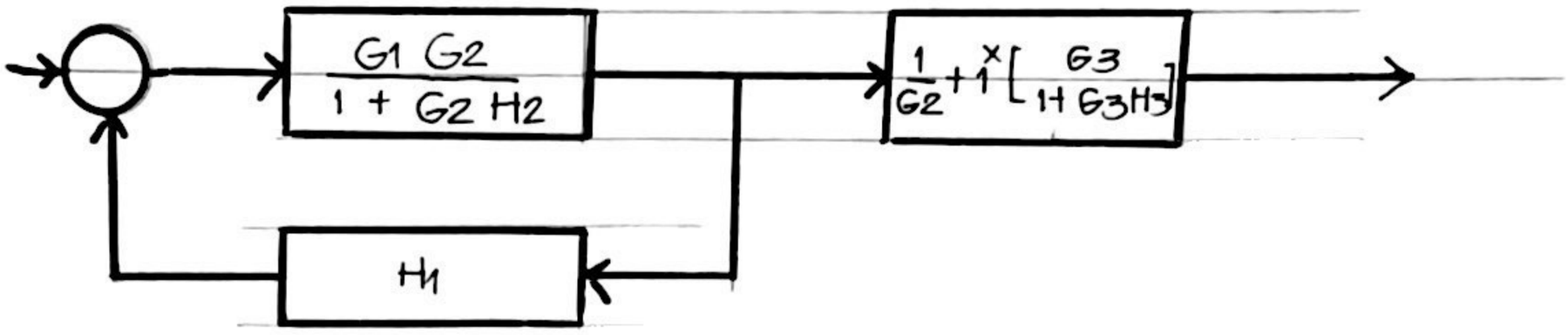
$$= \frac{s^3 - 4s}{s^3 - 2s^2 + s}$$

FOR $G1 \times [G2/(1 + G2H2)]$

$$= \frac{1}{s^2} \times \frac{s^2 - 1}{s^3 + s^2}$$

$$= \frac{s^2 - 1}{s^5 + s^4}$$

LABORATORY 3, BLOCK DIAGRAM NO. 1



$$\left[\frac{G_1G_2}{1+G_2H_2}\right] \Big/ \left[1+\frac{G_1G_2}{1+G_2H_2}\times H_1\right] = \frac{s^2-1/s^5+s^4}{1+[s^2-1/s^5+s^4](1/s)}$$

$$= \frac{s^2-1/s^5+s^4}{1+(s^2-1/s^6+s^5)}$$

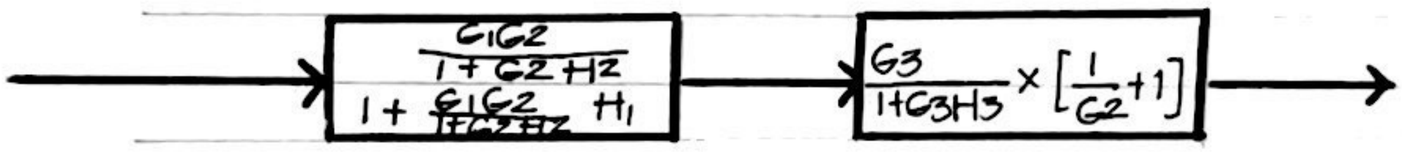
$$= \frac{s^2-1/s^5+s^4}{s^6+s^5+s^2-1/s^6+s^5}$$

$$= \frac{s^2-1}{s^5+s^4} \times \frac{s^6+s^5}{s^6+s^5+s^2-1}$$

$$\frac{-s^8+s^7-s^6-s^5}{s^{11}+s^{10}+s^7-s^5+s^{10}+s^9+s^6-s^4}$$

FINAL ANSWER

$$= \frac{s^8+s^7-s^6-s^5}{s^{11}+2s^{10}+s^9+s^7+s^6-s^5-s^4}$$



$$= \frac{s^8+s^7-s^6-s^5}{s^{11}+2s^{10}+s^9+s^7+s^6-s^5-s^4} \times \frac{s^3-4s}{s^3-2s^2+s}$$

$$\frac{-s^{11}+s^{10}-5s^9-5s^8+4s^7+4s^6}{s^{14}-2s^{12}+2s^{10}-s^9-2s^8+2s^7+s^6-s^5}$$