

Exercicios - aula 3/11

$$1) Y = TR, Y = (1+GH)^{-1} G R \Rightarrow T = (1+GH)^{-1} G$$

$$Z = HY \Rightarrow R - E = HY \Rightarrow R - G^{-1} Y = HY \Rightarrow R = Y(H + G^{-1}) = Y(1+GH)^{-1} G^{-1}$$

$$G^{-1} Y = R(1+GH)^{-1} \Rightarrow Y = \underbrace{G(1+GH)^{-1}}_T R \Rightarrow Y = TR$$

$$\underline{T = G(1+L)^{-1}}$$

$$2) Z = HY = HGE = HG(R-Z) \Rightarrow Z(1+HG) = HGR \Rightarrow \underline{ZR^{-1} = HG(1+HG)^{-1}}$$

$$\underline{\underline{\frac{Z}{R} = \frac{HG}{1+HG} = \frac{L}{1+L}}}}$$

$$3) Y = GH(R/H - Y) \Rightarrow Y(1+GH) = GR \Rightarrow \underline{\underline{\frac{Y}{R} = \frac{G}{1+GH}}}}$$

$$4) Y = \frac{G}{1+G(H-1)} \cdot (R-Y) \Rightarrow Y \left(1 + \frac{G}{1+G(H-1)}\right) = \frac{GR}{1+G(H-1)}$$

$$Y \left(\frac{1+GH - \cancel{1+G} + G}{1+G(H-1)} \right) = \frac{GR}{1+G(H-1)} \Rightarrow \underline{\underline{\frac{Y}{R} = \frac{G}{1+GH}}}}$$

$$5) G_1((R-Y) - (H-1)Y) = Y \Rightarrow Y = G_1(R - HY) \Rightarrow Y(1+GH) = GR \Rightarrow \underline{\underline{\frac{Y}{R} = \frac{G}{1+GH}}}}$$

$$6) G_1(R - (H-1)Y - Y) = Y \Rightarrow Y = G_1(R - YH) \Rightarrow Y(1+GH) = GR \Rightarrow \underline{\underline{\frac{Y}{R} = \frac{G}{1+GH}}}}$$

$$7) \text{ Considerando } G_2 G_1 = G_2 G_2 \Rightarrow (R-Y)(G_1 G_2) = Y \Rightarrow Y(1+G_1 G_2) = G_1 G_2 R \Rightarrow \underline{\underline{\frac{Y}{R} = \frac{G_1 G_2}{1+G_1 G_2}}}}$$

$$8) R=0 \Rightarrow Y_2 = G_2(D - G_1 Y_2) \Rightarrow Y_2(1+G_2 G_1) = G_2 D \Rightarrow \underline{\underline{Y_2 = \frac{G_2 D}{1+G_2 G_1}}}}$$

$$9) Y = G_2(G_1(R-Y) + D) \Rightarrow Y(1+G_2 G_1) = G_2 G_1 R + G_2 D \Rightarrow \underline{\underline{Y = \frac{G_2 G_1 R}{G_2 G_1 + 1} + \frac{G_2 D}{G_2 G_1 + 1}}}}$$

$$10) \quad (W \pm X) \pm Y = Z \quad (\pm X \pm Y) + W = Z \quad \Rightarrow \text{equivalentes}$$

$$Z = W \pm Y \pm X \quad Z = W \pm X \pm Y$$

$$11) \quad Y = \left(G_2 \left(G_1 (R - H_3 Y) - \frac{H_2 Y}{G_4} \right) \right) \frac{G_3 G_4}{1 - G_3 G_4 H_1} \Rightarrow Y \left(1 + \frac{G_2 G_3 G_4}{1 - G_3 G_4 H_1} \left(G_1 H_3 + \frac{H_2}{G_4} \right) \right) = \frac{R G_1 G_2 G_3 G_4}{1 - G_3 G_4 H_1}$$

$$\frac{Y}{R} = \frac{G_1 G_2 G_3 G_4}{1 - G_3 G_4 H_1 + G_2 G_3 H_2 + G_1 G_2 G_3 G_4 H_3}$$

$$12) \quad Y = \frac{G_2 G_3 G_4}{1 - G_3 G_4 H_1 + G_2 G_3 H_2} \left(G_1 (R - H_3 Y) \right) \Rightarrow Y (1 - G_3 G_4 H_1 + G_2 G_3 H_2) = (G_1 R - G_1 H_3 Y) G_2 G_3 G_4$$

$$\frac{Y}{R} = \frac{G_1 G_2 G_3 G_4}{1 - G_3 G_4 H_1 + G_2 G_3 H_2 + G_1 G_2 G_3 G_4 H_3}$$

$$13) \quad \frac{Y}{R} = \frac{G_1 G_2 G_3 G_4}{1 - G_3 G_4 H_1 + G_2 G_3 H_2 + G_1 G_2 G_3 G_4 H_3}$$