

## Tema curs 1

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Grupa 30121

Determinarea functiei de transfer a unui FTS in montaj neinversor dupa

$$\text{formula } H(s) = \frac{Y(s)}{U(s)}$$

Handwritten derivation of the transfer function  $H(s) = \frac{Y(s)}{U(s)}$  for the inverting active filter circuit shown above.

$$Y(s) = \frac{R_2}{R_2 + \frac{1}{sC_2}} V(s) = \frac{R_2 C_2 s}{1 + R_2 C_2 s} V(s)$$

$$\Rightarrow V(s) = \frac{1 + R_2 C_2 s}{R_2 C_2 s}$$

$$U(s) = \frac{V(s) - Y(s)}{\frac{1}{sC_1}} = \frac{V(s) - Y(s)}{R_1} + \frac{V(s) - Y(s)}{\frac{1}{sC_2}}$$

$$sC_1 U(s) = sC_1 \cdot \frac{1 + R_2 C_2 s}{R_2 C_2 s} = \frac{1 + R_2 C_2 s}{R_1 R_2 C_2 s} Y(s) -$$

$$- \frac{1}{R_1} Y(s) + sC_2 \frac{1 + R_2 C_2 s}{R_2 C_2 s} Y(s) - sC_2 V(s)$$

$$U(s) - \frac{1 + R_2 C_2 s}{R_2 C_2 s} Y(s) = \frac{1 + R_2 C_2 s}{R_1 R_2 C_1 C_2 s^2} Y(s) -$$

$$- \frac{1}{R_1 C_1 s} Y(s) + \frac{sC_2 + R_2 C_2^2 s^2}{R_2 R_1 C_2 s^2} Y(s) - \frac{C_2 Y(s)}{C_1}$$

$$U(s) = Y(s) (R_1 C_1 s + R_1 G_2 R_2 C_2 s^2 + 1 + \cancel{R_2 G_2 s} + \cancel{R_1 C_2 s} - \cancel{R_2 C_2 s} + \cancel{R_1 R_2 C_2^2 s^2} - \cancel{R_1 R_2 C_2^2 s^2})$$

$$\frac{Y(s)}{U(s)} = \frac{R_1 R_2 C_1 C_2 s^2}{R_1 R_2 C_1 C_2 s^2 + (R_1 C_1 + R_1 C_2)s + 1}$$

$$\frac{Y(s)}{U(s)} = \frac{R_1 R_2 C_1 C_2 s^2}{R_1 R_2 C_1 C_2 s^2 + (R_1 C_1 + R_1 C_2)s + 1}$$

$$\frac{Y(s)}{U(s)} = \frac{\cancel{R_1 R_2 C_1 C_2} s^2}{\cancel{R_1 R_2 C_1 C_2} s^2 + \left( \frac{1}{R_2 C_2} + \frac{1}{R_2 C_1} \right) s + \frac{1}{R_1 R_2 C_1 C_2}}$$

$$H(s) = \frac{s^2}{s^2 + \frac{1}{R_2} \left( \frac{1}{C_1} + \frac{1}{C_2} \right) s + \frac{1}{R_1 R_2 C_1 C_2}}$$