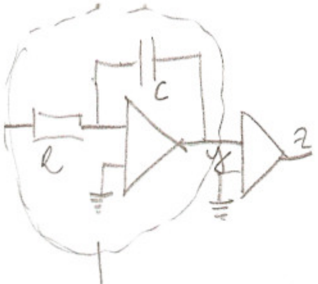
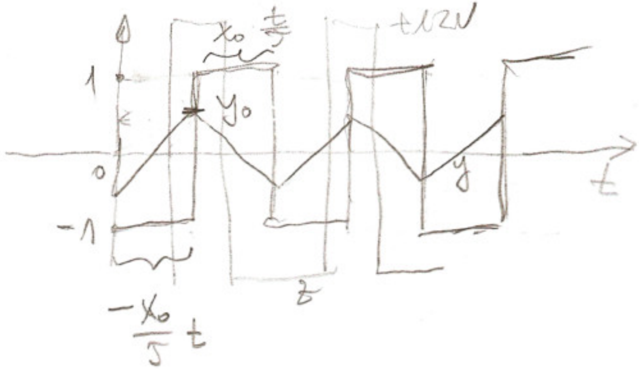
(1)



integrator



$$\frac{x}{R} + Cp\,z = 0$$

$$z = -\frac{1}{RC}\int_{-\infty}^{t} x\,dt' \Rightarrow$$ pulzi so simetrični, dobimo trikotne pulze

v eni periodi dobimo: $\frac{x_0}{\tau} t_0 = \Delta y$; $2t_0 = \frac{1}{\nu}$

$$y_0 = \frac{x_0}{\tau}\frac{t_0}{2} = \frac{x_0}{\tau}\frac{1}{2\nu}\frac{1}{2} = \frac{x_0}{4\nu\tau}$$

širina pulze:

$$y = -\frac{x_0}{2\tau}t_0 + \frac{x_0}{\tau}t$$

$$y_0 = \frac{x_0}{\tau}\left(t - \frac{t_0}{2}\right)$$

$$\nu = \frac{x_0}{4y_0\tau} = \frac{\cancel{x_0}}{4\,0.5\,\cancel{x_0}\,\tau} = \frac{1}{2\tau} = 1000\,Hz$$

$$\frac{\tau y_0}{x_0} + \frac{t_0}{2} = t \Rightarrow t_0 - t = \left(\frac{t_0}{2} - \frac{\tau y_0}{x_0}\right) = \Delta t/2$$

$$\Delta t = t_0 - \frac{2y_0\tau}{x_0} = \frac{1}{2\nu} - \frac{2y_0\tau}{x_0} = \frac{1}{2\nu} - \frac{2\cdot 0.5\cancel{x_0}\tau}{\cancel{x_0}} = \frac{1}{2\nu} - \tau$$

Vezje bo delovalo dokler bo izhod iz integratorja ne bo dosegel saturacije: $y_0 = 12V$

$$\nu = \frac{x_0}{4y_0\tau} = \frac{1}{4\cdot 12V\cdot 0.5ms} = \frac{1}{24ms} = 41\,Hz$$

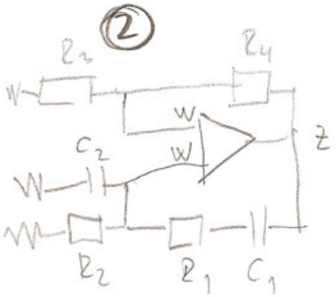
(3)

$$D_A = CTR \oplus \overline{Q_B}$$

$$D_B = CTR \oplus Q_A$$

$$z = Q_A Q_B \oplus CTR$$

z	Q_A	Q_B	CTR	D_A	D_B
0	0	0	0	1	0
0	1	0	0	1	1
1	1	1	0	0	1
0	0	1	0	0	0
1	0	0	1	0	1
1	0	1	1	1	1
0	1	1	1	1	0
1	1	0	1	0	0

② 

① $\frac{z-w}{R_4} - \frac{w}{R_3} = 0 \Rightarrow z = w\left(1+\frac{R_4}{R_3}\right)$

② $\frac{z-w}{R_1+\frac{1}{C_1p}} - \frac{w}{R_2} - C_2p\,w = 0$

$$z-w - w\left(\frac{1}{R_2}+C_2p\right)\left(R_1+\frac{1}{C_1p}\right)=0$$

$$z-w-w\left(\frac{R_1}{R_2}+R_1C_2p+\frac{1}{R_2C_1p}+\frac{C_2}{C_1}\right)=0$$

$$R_2C_1pz - w\ R_2C_1p - wR_1C_1p + R_1C_1R_2C_2p^2w - wR_2C_2p - w = 0$$

$$R_2C_1pz - w(R_2C_1p + R_1C_1p + R_1C_1R_2C_2p^2 + R_2C_2p + 1) = 0$$

$$R_2C_1pz - \frac{z}{1+\frac{R_4}{R_3}}(T_{21}p + T_{11}p + T_{11}T_{22}p^2 + T_{22}p + 1) = 0$$

$$\left(1+\frac{R_4}{R_3}\right)T_{21}pz - z(\qquad\qquad)=0$$

$$z\left(\cancel{T_{21}p} - \cancel{T_{21}p} + \frac{R_4}{R_3}T_{21}p - T_{11}p - T_{22}p - T_{22}T_{11}p^2\right)=0$$

$$z\left(T_{22}T_{11}p^2 + p\left(T_{11}+T_{22}-\frac{R_4}{R_3}T_{21}\right)+1\right)=0$$

$$T_{11}+T_{22}-\frac{R_4}{R_3}T_{21}=0$$

$$T_{21}\frac{R_4}{R_3} = T_{11}+T_{22} \Rightarrow \frac{R_4}{R_3} = \frac{T_{11}+T_{22}}{T_{21}} = \frac{R_1+R_2}{R_2}$$

$$= \frac{2R_2+R_2}{R_2} = \underline{\underline{3}}$$

$1\,\mu F = C_1 = C_2 = C$
$1\,k\Omega = R_1 = 2R_2$

$$\frac{R_4}{R_3} = \frac{3R_2}{R_2} = \cancel{2}\ 3$$

$$\ddot{z} + \frac{1}{T_{22}T_{11}}z = 0$$

$$\omega_0 = \frac{1}{\sqrt{T_{22}T_{11}}} = \frac{1}{\sqrt{R_1R_2}C} = \sqrt{2}\cdot\frac{1}{1\,ms} \approx 1400\,s^{-1}$$