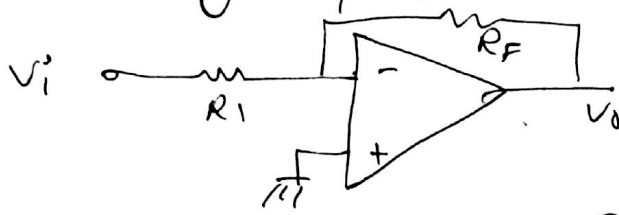


Lec (25-28) semi (المضخمه النصفية) Operational Amplifiers (op. amp)

(1)

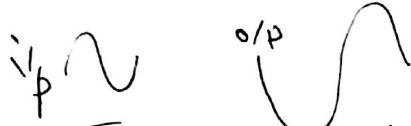
[1] inverting Amplifier

المخرج عكس الطور هو العاكس



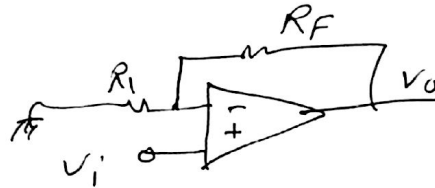
$$\frac{V_o}{V_i} = - \frac{R_F}{R_1}$$

المخرج عكس الطور



زيادة R_F من R_1 على التوالي في خرج أكبر مدخل (تقريب) بتقليل (تضخيم) - أقل

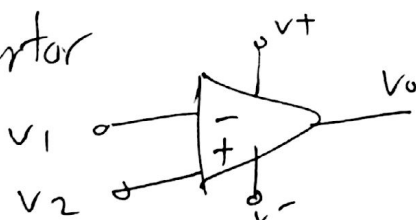
[2] non inverting



$$\frac{V_o}{V_i} = 1 + \frac{R_F}{R_1}$$

المخرج عكس الطور بتقليل المدخل (تضخيم) أو على الأقل = مدخل (تضخيم) أو على الأقل = مدخل (تضخيم)

[3] comparator

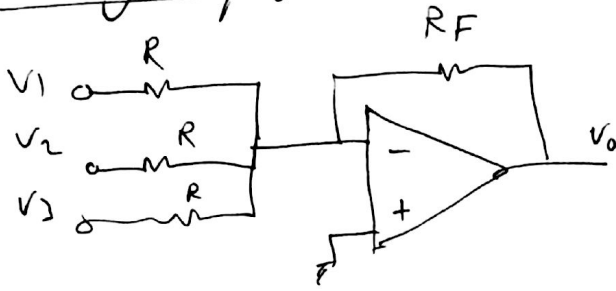


دوائر (Reference voltage)

$v_1 > v_2 \therefore v_o =$ (عبر المنطق)
 $v_1 < v_2 \therefore v_o =$ (عبر المنطق)

(2)

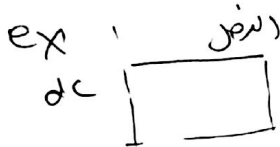
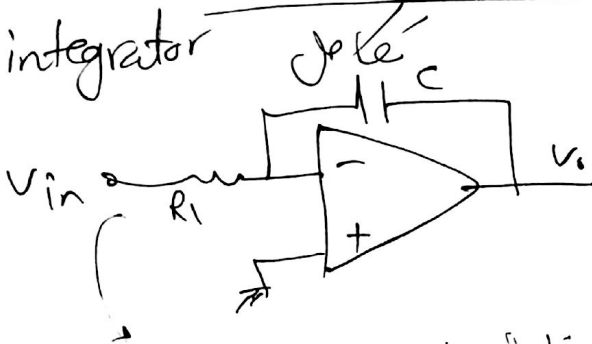
4) Summing Amplifier



$$V_0 = -\frac{R_F}{R} (V_1 + V_2 + V_3)$$

if $R_F = R$
 $\therefore V_0 = -(V_1 + V_2 + V_3)$
 جمع الاعداد

5) integrator



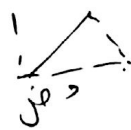
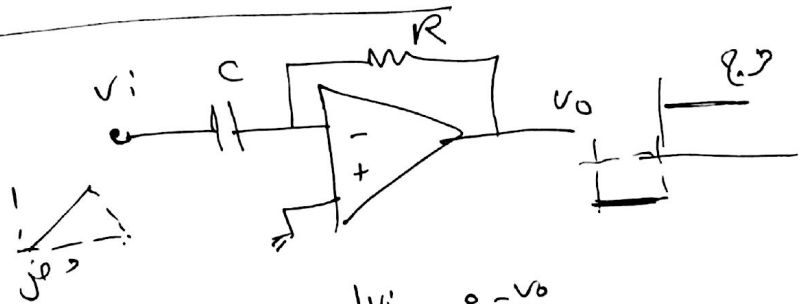
$$\frac{V_{in} - 0}{R_i} = C \frac{d(0 - V_0)}{dt}$$

$$\Rightarrow \frac{V_{in}}{R} = -C \frac{dV_0}{dt}$$

$$-\frac{V_{in}}{Rc} = \frac{dV_0}{dt}$$

or $V_0 = -\frac{1}{Rc} \int V_{in} dt$
 جمع الجهد

6) differentiator



$$\Rightarrow C \frac{dV_i}{dt} = 0 - \frac{V_0}{R}$$

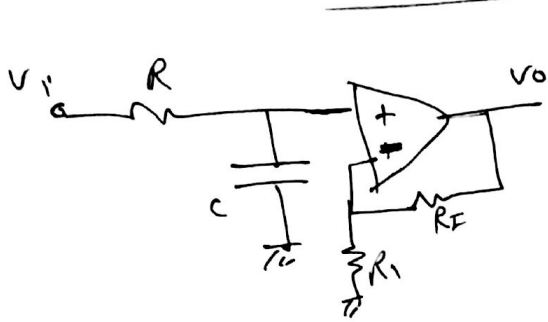
جمع الجهد

$$V_0 = -Rc \frac{dV_i}{dt}$$

3

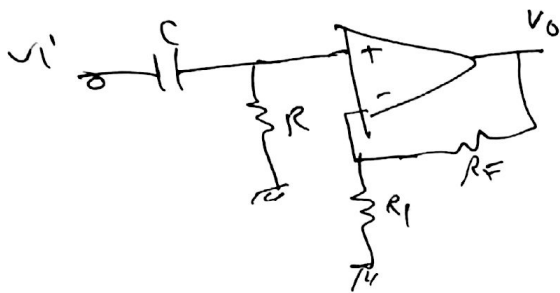
Filters as applications

(active Filters)

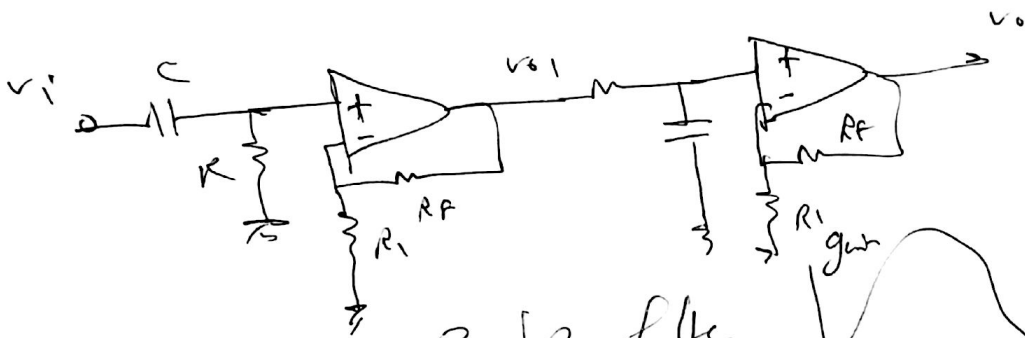


LPF

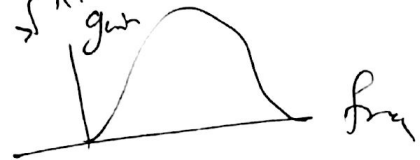
$$f_c = \frac{1}{2\pi RC}$$



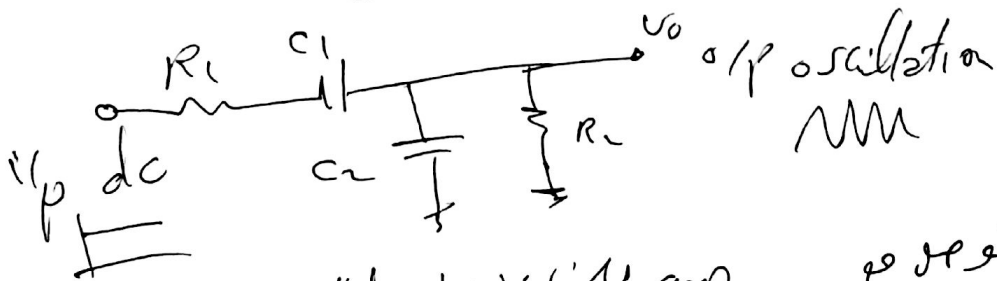
HPF



Band Pass filter

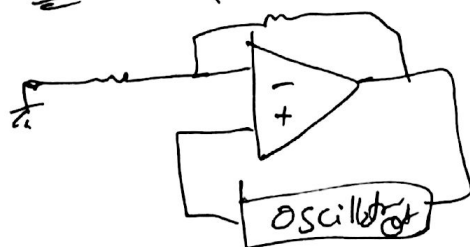


Oscillator



Oscillator (RC phase shift)

oscillator



hardly
collyts
crystal