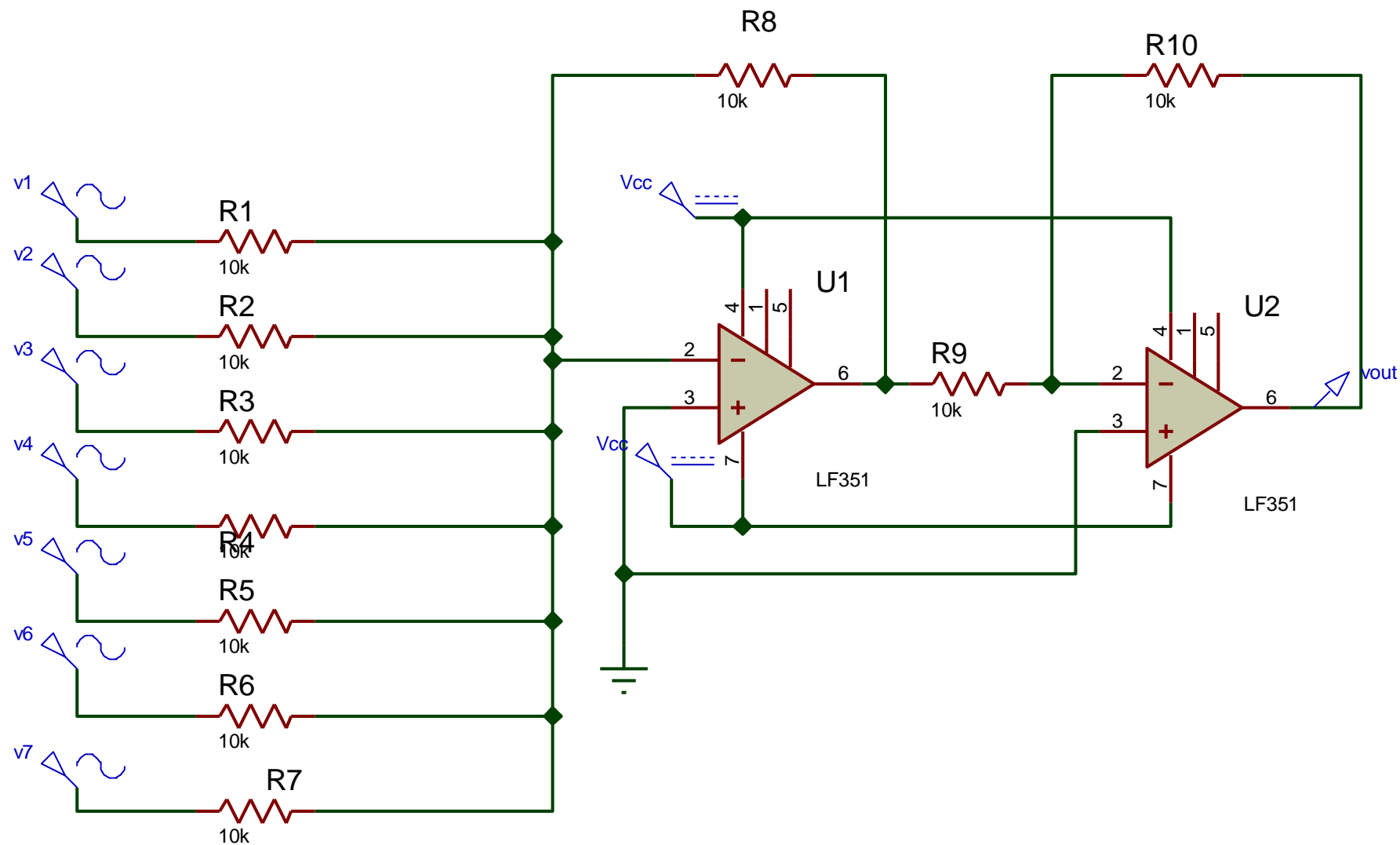


ONDA QUADRA ALTERNATA PARI :

sviluppo in Serie di FOURIER

1° CIRCUITO : SOMMATORE INVERTENTE ($G = -1$) + AMPLI INVERTENTE ($G = -1$)



- Onda quadra alternata pari con frequenza $f_0=1$ [KHz] \gggg $T_0 = 1$ [ms] $V_{pp} = 1$ [V]
- L'onda quadra è ottenibile sommando un n° infinito di *componenti armoniche* di frequenza multipla della *fondamentale*, che coincide con quella dell'onda quadra f_0 , in questo caso 1000 [Hz]
- Le armoniche sono *coseni*, la cui ampiezza max (B_k) è data dalla formula :

$$B_k = 2V_{pp} * \tau / T \frac{\sin (k\pi \tau / T)}{k\pi \tau / T} = \frac{2}{k\pi} \sin (k\pi / 2)$$

$$B_1 = + 0,64 \text{ [V]}$$

$$B_3 = - 0,21 \text{ "}$$

$$B_5 = + 0,13 \text{ "}$$

$$B_7 = - 0,09 \text{ "}$$

$$B_9 = + 0,07 \text{ "}$$

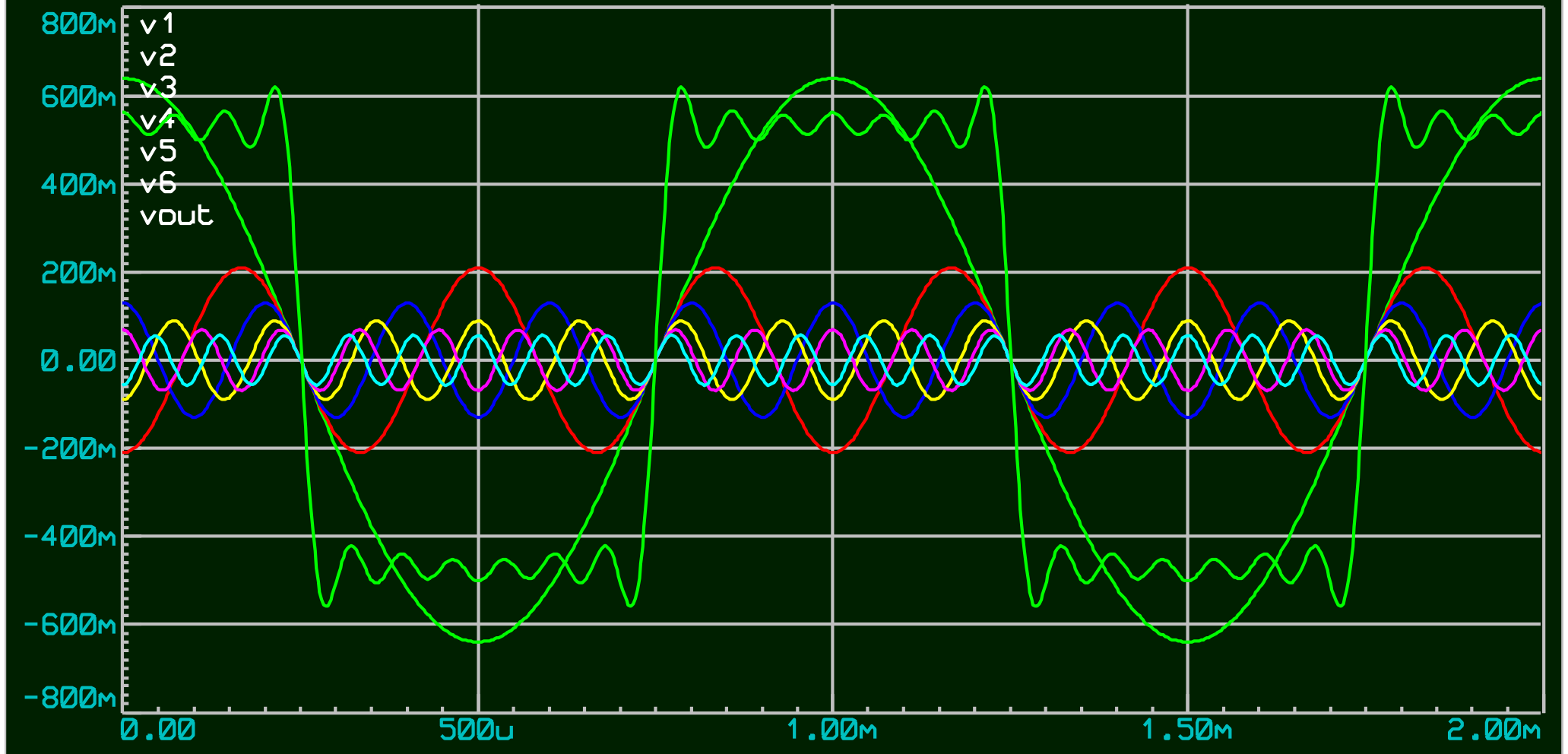
$$B_{11} = - 0,06 \text{ "}$$

$$B_{13} = + 0,05 \text{ "}$$

Perciò :

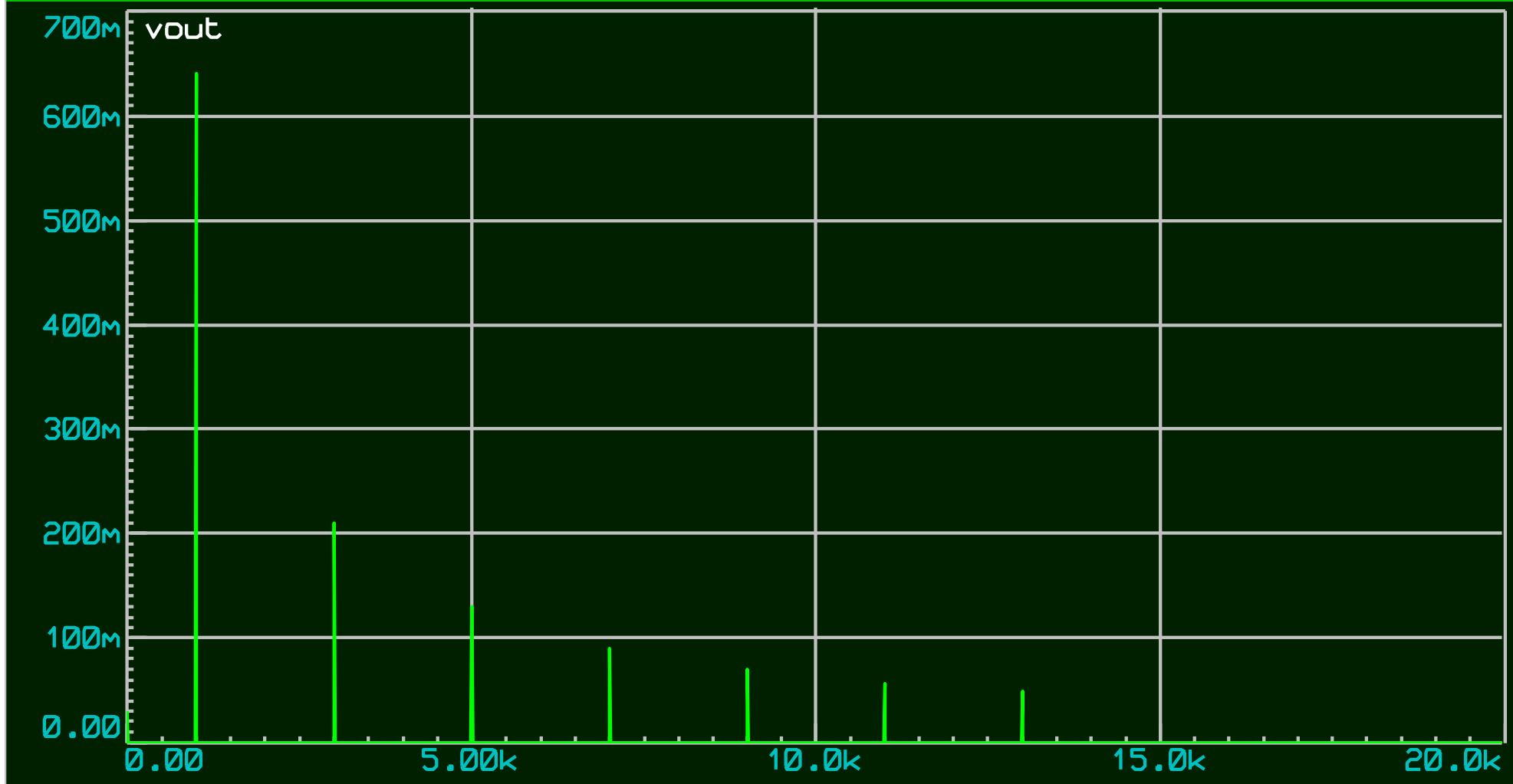
$$V_{out}(t) = + 0,64 \cos(2\pi 1000t) - 0,21 \cos(2\pi 3000t) + 0,13 \cos(2\pi 5000t) - 0,09 \cos(2\pi 7000t) + 0,07 \cos(2\pi 9000t) + \\ - 0,06 \cos(2\pi 11000t) + 0,05 \cos(2\pi 13000t) + \dots$$

ANALOGUE ANALYSIS



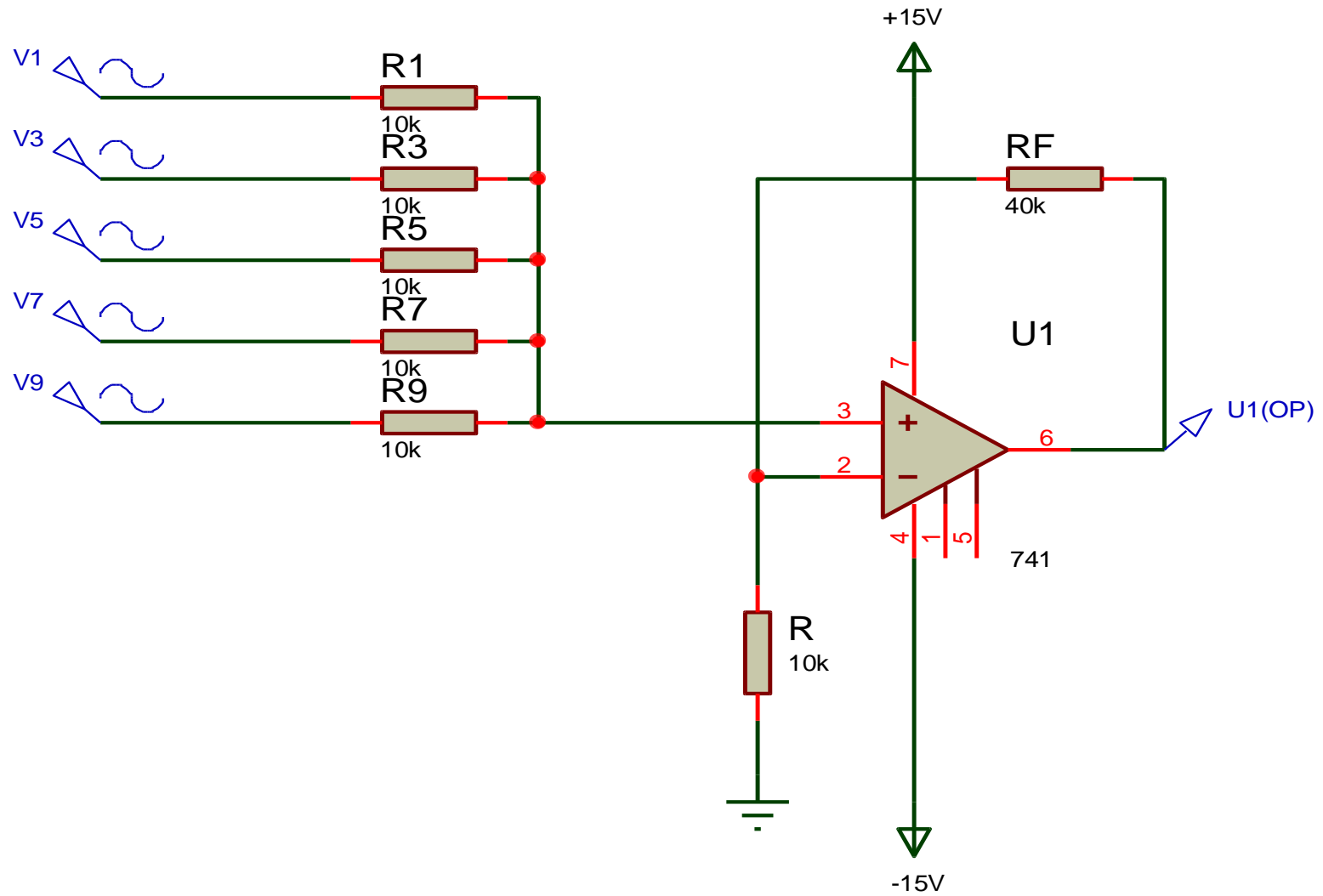
Ricostruzione dell' ONDA QUADRA dalle sue componenti armoniche

FOURIER ANALYSIS

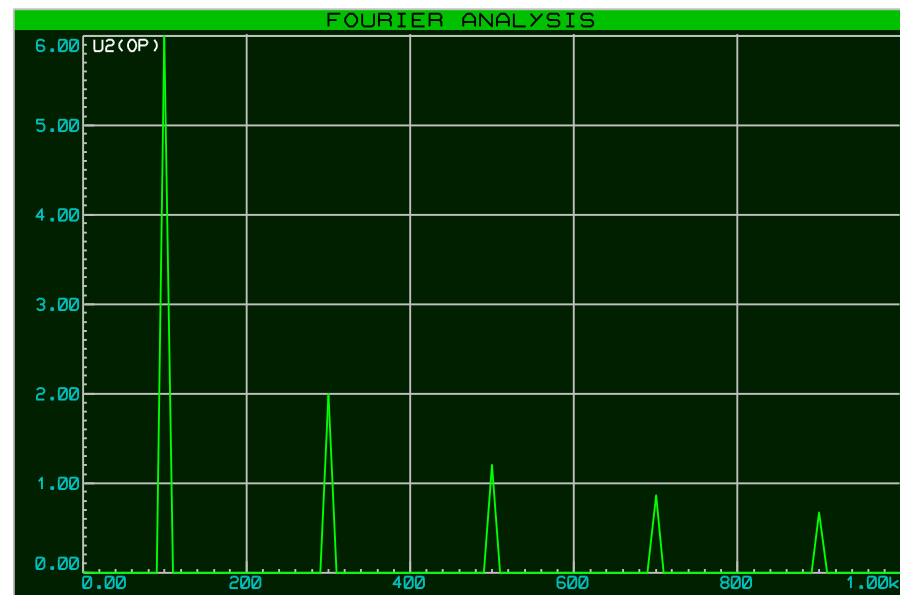
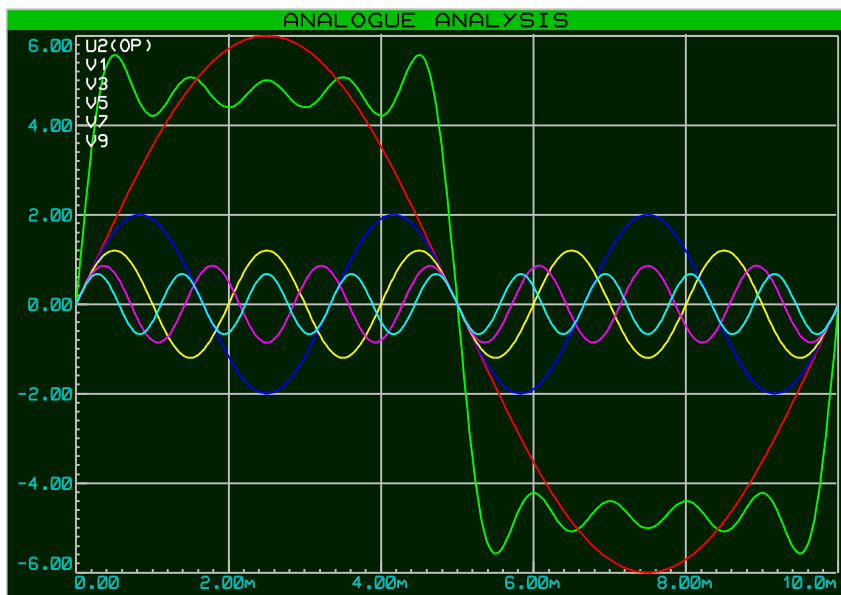
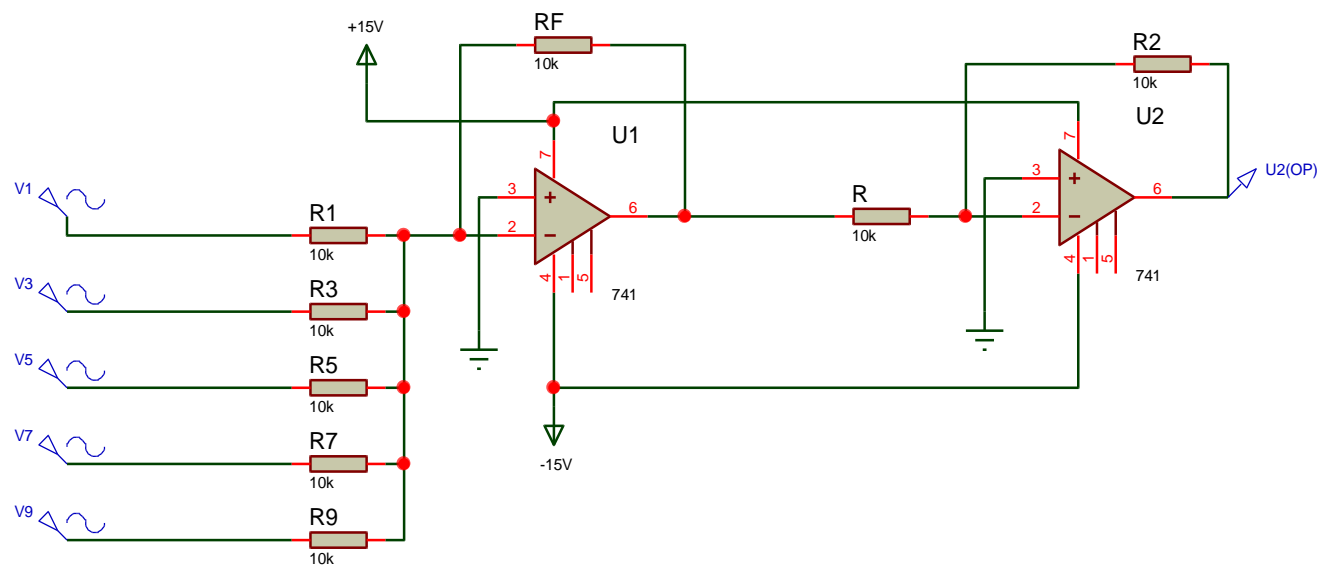


SPETTRO DI FOURIER DELLE AMPIEZZE

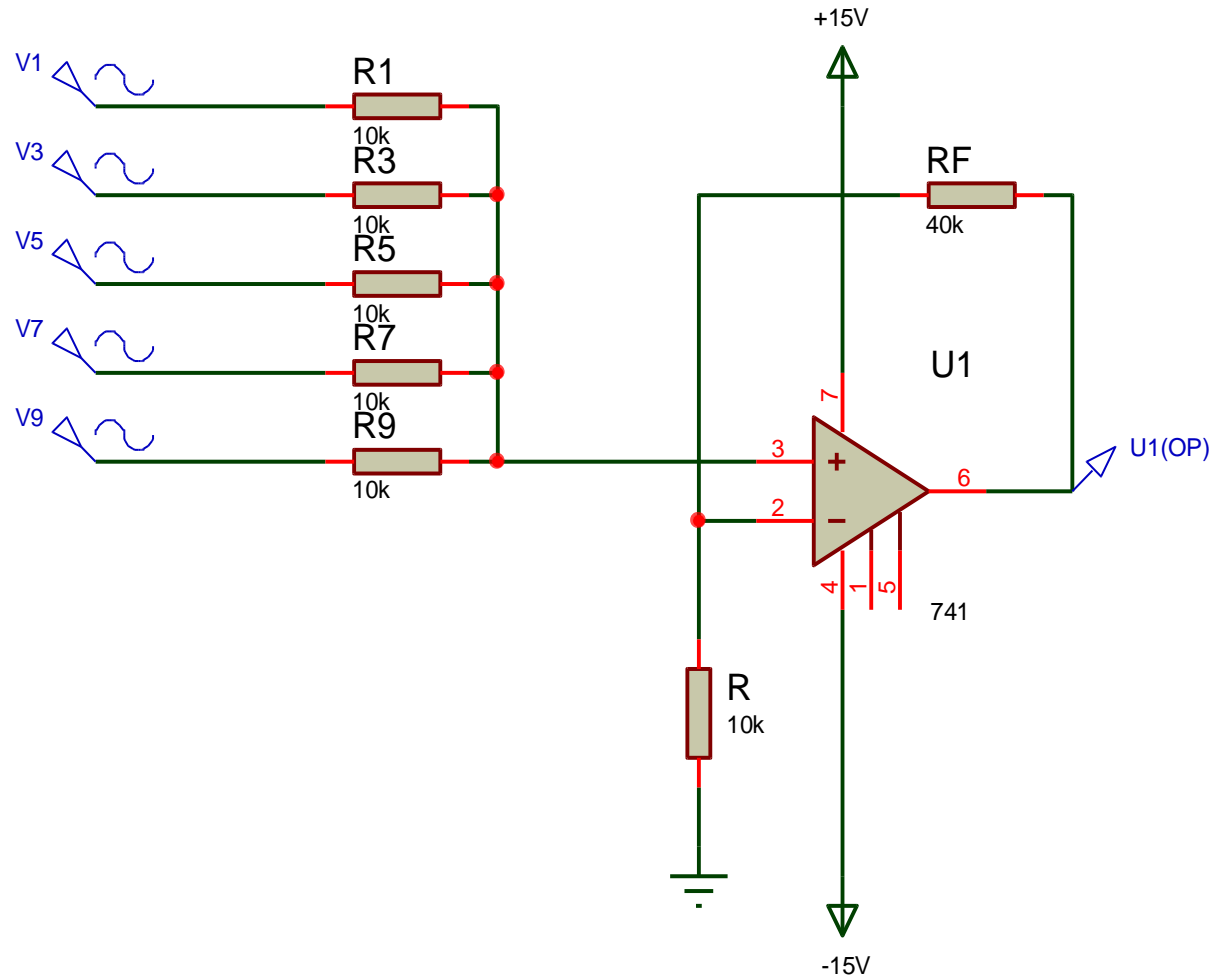
2° circuito : ONDA QUADRA ALTERNATA PARI , TRAMITE SOMMATORE NON INVERTENTE



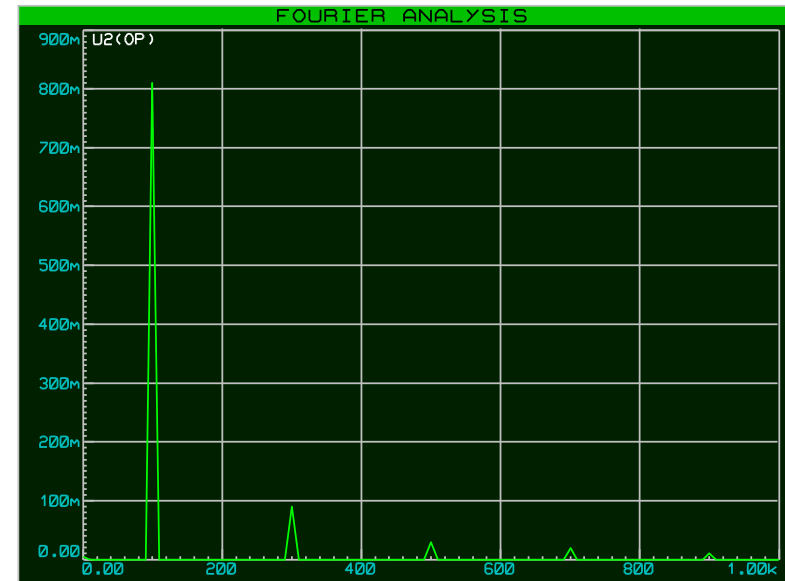
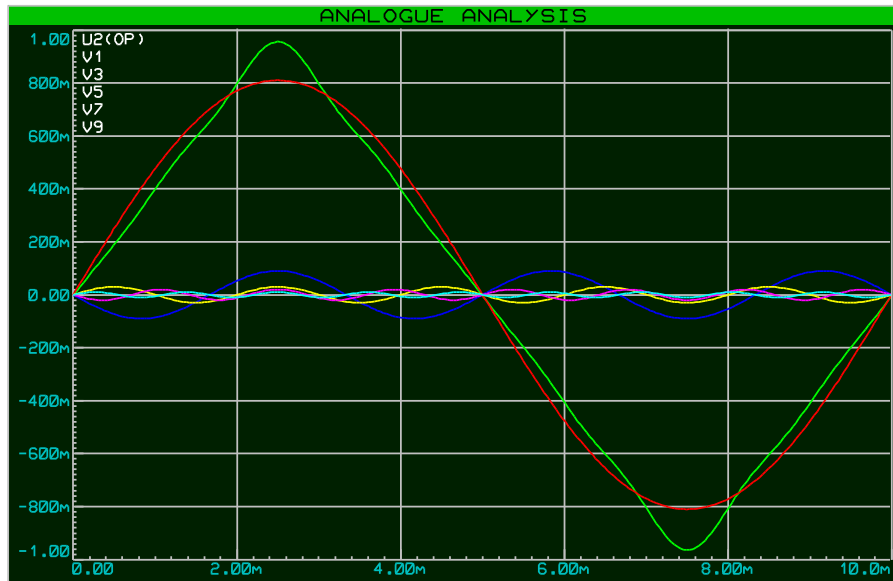
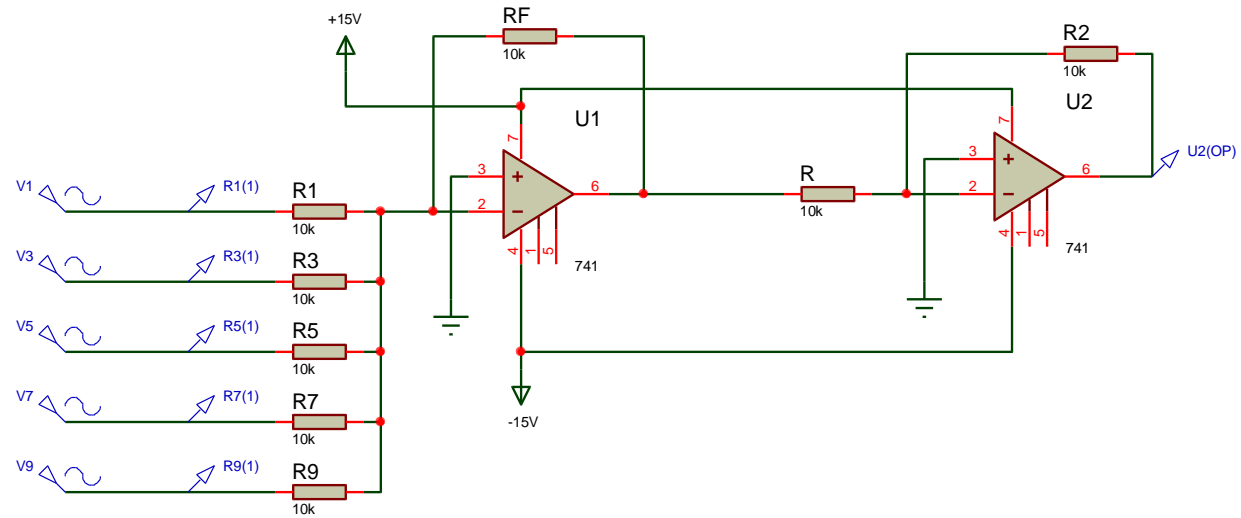
3. ONDA QUADRA ALTERNATA **DISPARI**, TRAMITE SOMMATTORE INVERTENTE



4. ONDA QUADRA ALTERNATA **DISPARI** TRAMITE SOMMATORE NON INVERTENTE



5. ONDA TRIANGOLARE ALTERNATA TRAMITE SOMMATTORE INVERTENTE



6. ONDA TRIANGOLARE ALTERNATA TRAMITE SOMMATORE NON INVERTENTE

