Hadi Mahajan
19BEE0032

Exp. no → 4

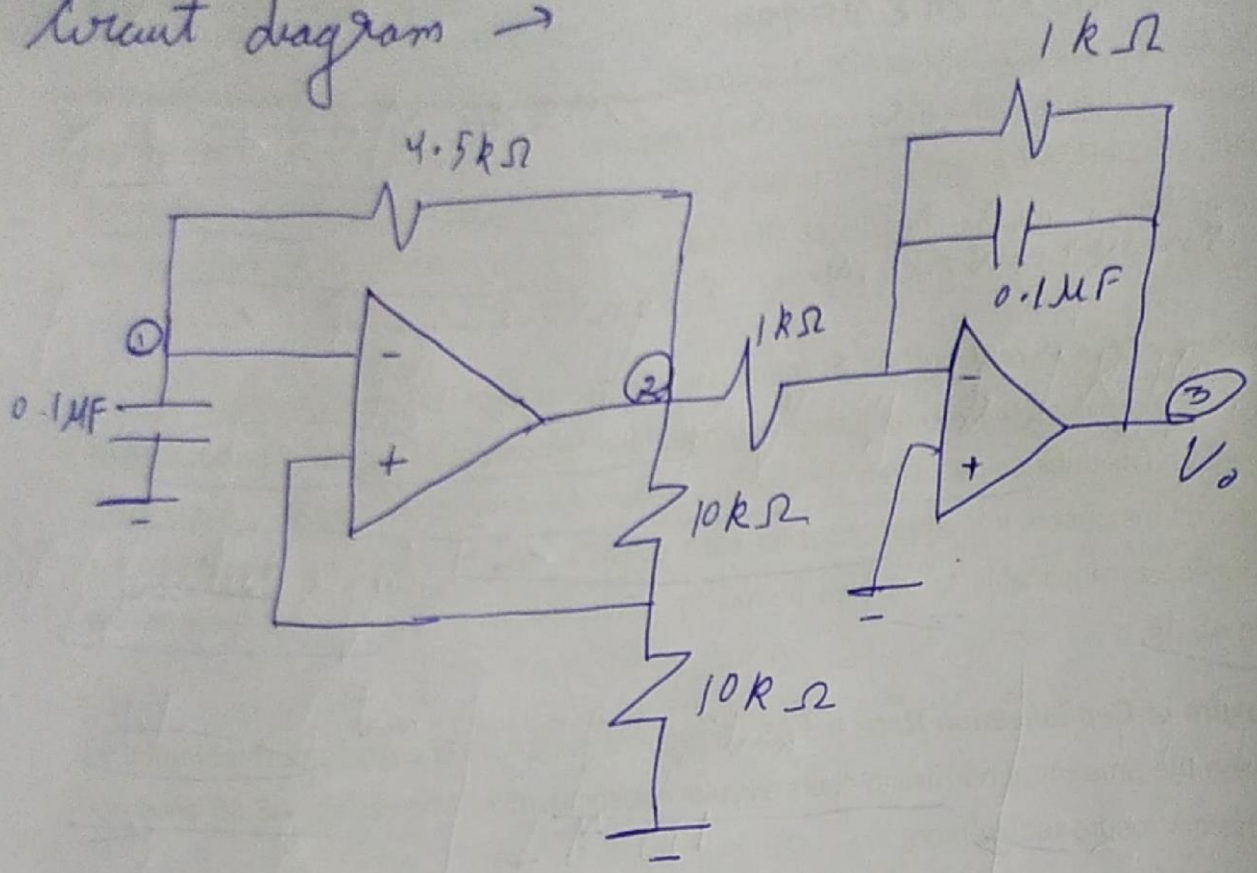
Date → 20 August 2020

Aim → Design a square wave & triangular wave generator for a frequency of 1 kHz.

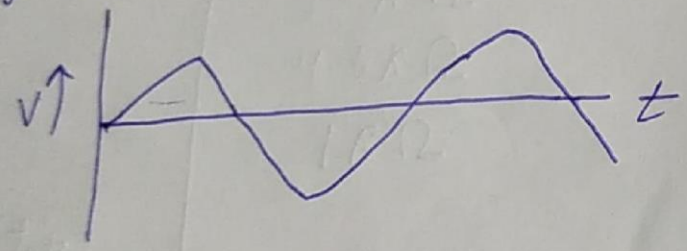
Apparatus required →

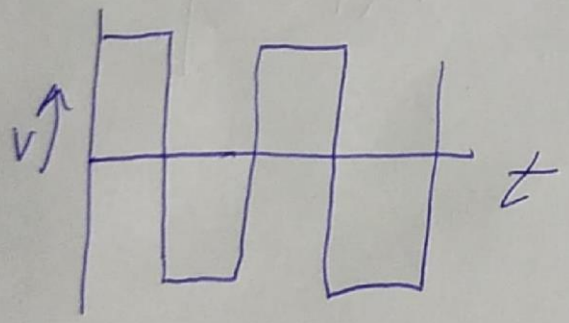
Name of item	Specification	Quantity
Op-amp	LM-741	2
Resistor	10 kΩ	2
	4.5 kΩ	1
	1 kΩ	2
Capacitor	0.1 μF	2

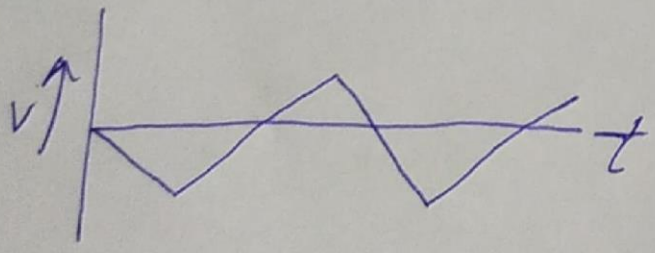
Circuit diagram →



Model graph →

① 

② 

③ 

Calculations → F = 1 kHz

$$\Rightarrow T = 1\,ms = \frac{1}{F}$$

$$\beta = \frac{R_2}{R_1 + R_2} = \frac{10\,K}{10K + 10k} = 0.5$$

$$T = 2RC \ln\left(\frac{1+\beta}{1-\beta}\right)$$

$$= 2RC \ln\left(\frac{1.5}{0.5}\right)$$

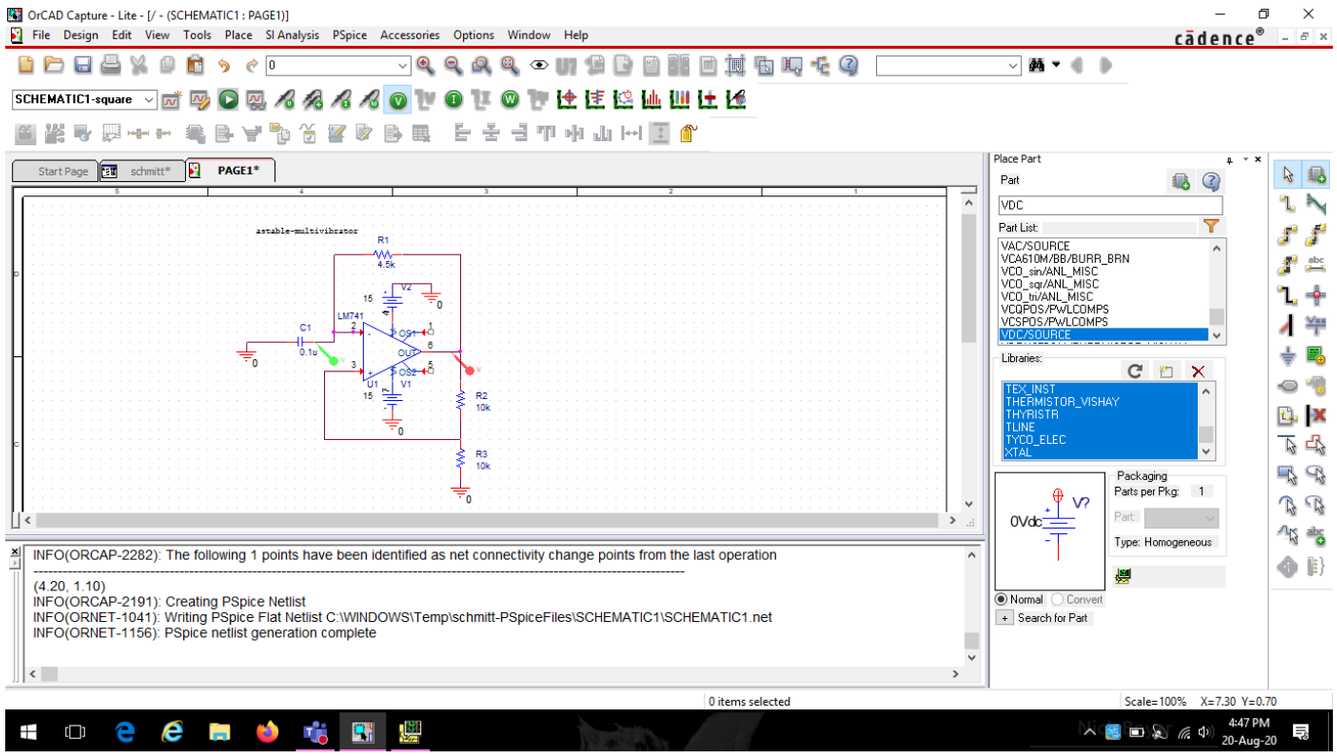
$$= 2.197RC$$

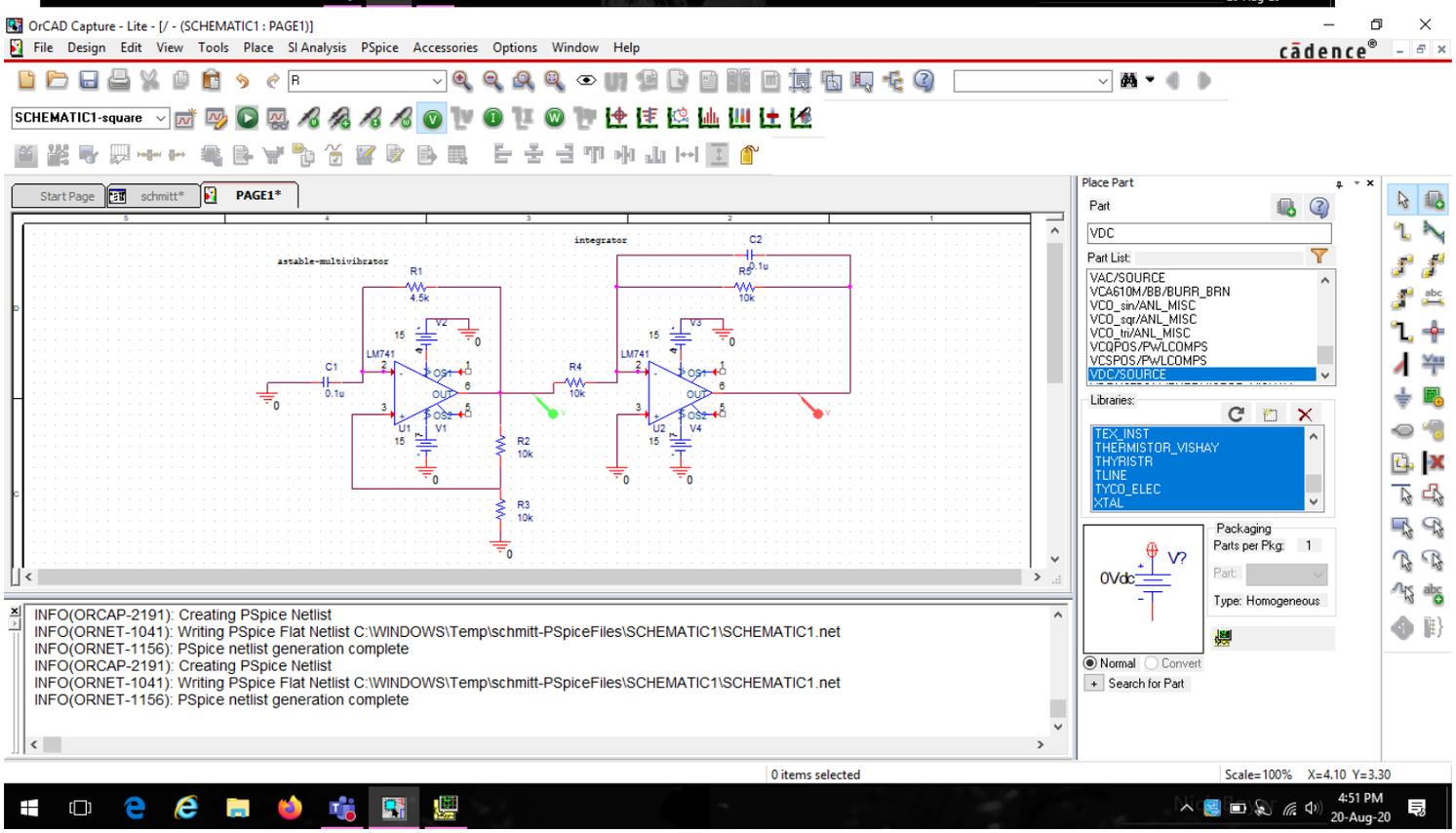
Assuming $C = 0.1\,MF$

$$1\,ms = 2.197(R) \times (0.1 \times 10^{-6})$$

$$\Rightarrow R = \frac{10^{-3}}{2.197 \times 0.1 \times 10^{-6}} = 4.5k\Omega$$

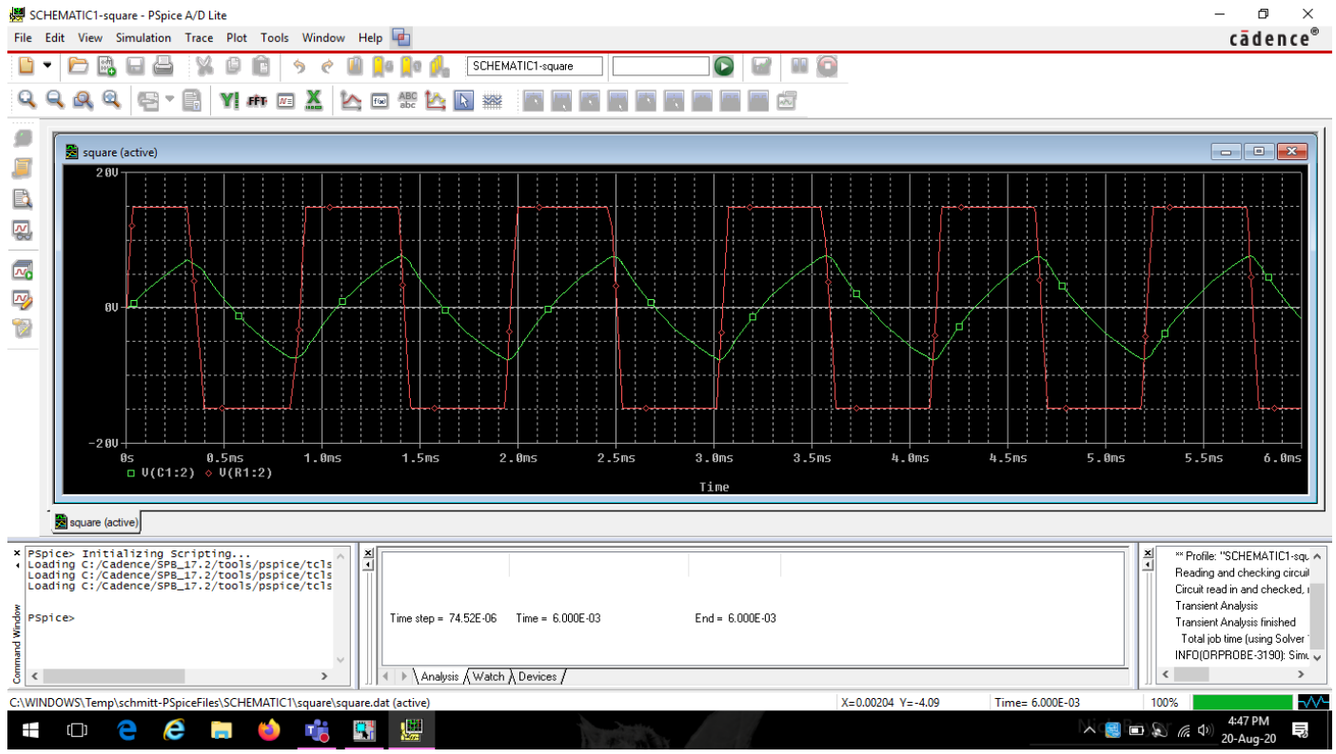
SIMULATION DIAGRAM:-





OUTPUT GRAPHS :-

(Graph after astable-multivibrator)



(Graph after integrator)

Result & Inference → The input & output signals have a phase shift of 180° & the amplitude of output is also decreased.