

## EXPERIMENT-9

### Voltage Controlled Oscillator

- a. Aim:**
- To Design a Voltage Controlled Oscillator.
  - To Verify the functionality of above circuits.

### b. Apparatus

**Hardware:**

- Resistors (1k $\Omega$ , 100k $\Omega$ , 10k $\Omega$ )
- Capacitors (50nF)
- LM 741
- Regulated Power Supply
- Bread board
- Transistor (BC107)
- DSO

**c. Theory:**

A Voltage-Controlled Oscillator (VCO) is an electronic oscillator whose oscillation frequency is controlled by a voltage input. The frequency of the output signal varies in relation to the amplitude of the input control voltage. VCOs are widely used in signal generators, phase-locked loops (PLL's), and frequency modulation applications.

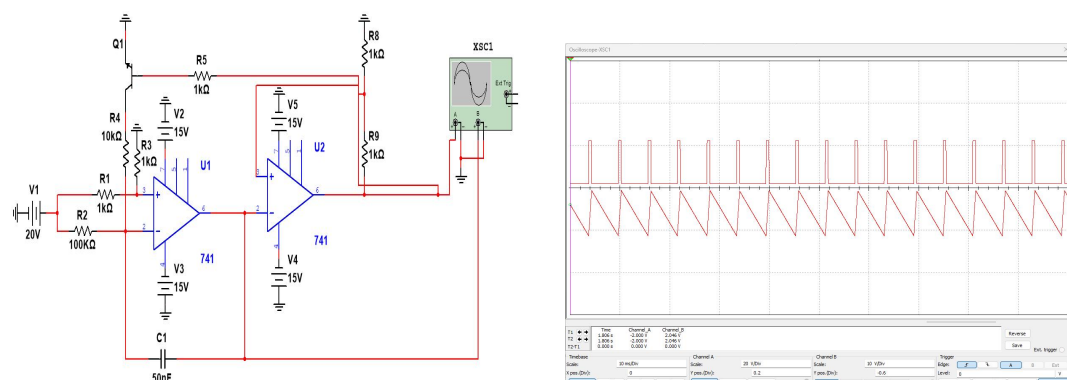
**d. Procedure:**

- Connect the circuit as per the circuit diagram
- Apply input as per the requirements and observe the outputs.
- Observe the outputs of VCO using a DSO.
- Check the voltage and frequency of the generated waveform(square).

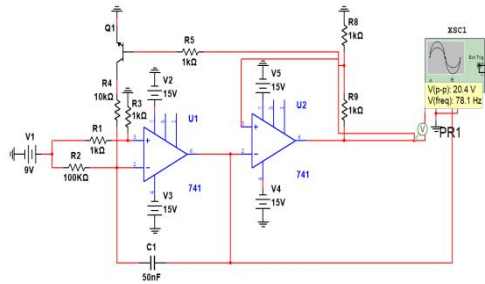
**Design:**

$$f = \frac{V_{in}}{2\pi R C V_{ref}}$$

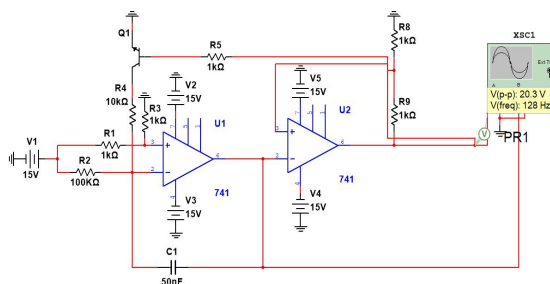
**e. Simulation Observation:**



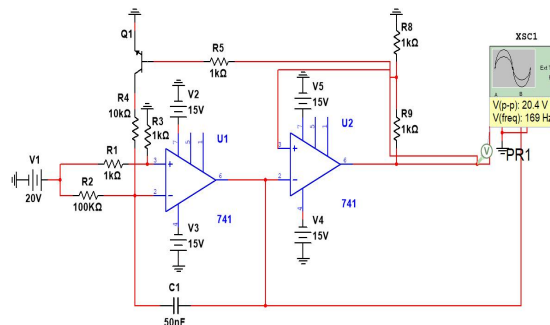
**Fig 1: VCO circuit**

**Case 1:  $V_{in} = 9V$** 

For input  $V_{in} = 9V$ , Square wave of frequency 78.1Hz is generated.

**Case 2:  $V_{in} = 15V$** 

For input  $V_{in} = 15V$ , square wave of frequency 128Hz is generated.

**Case 2:  $V_{in} = 20V$** 

For input  $V_{in} = 20V$ , square wave of frequency 169Hz is generated.

**CONCLUSION:**

From above cases we have observed that as input  $V_{in}$  is increases, frequency of square wave is increases.

**f. Result:**

Hence, we have designed, implemented and verified VCO.

Signature of the Faculty