AIM:

To design a schmitt trigger and to study their operation.

APPARATUS REQUIRED:

S.No.	APPARATUS	TYPE	RANGE	QUANTITY
1)	Op-Amp	µA741		1
2)	Resistors		29K, 1K, 16K, 1.6K	1
3)	Capacitors		0.1µF	1
4)	Signal Generator			1
5)	CRO			1
6)	Dual power supply			1
7)	Bread Board			1
8)	Connecting wires			

THEORY:

Schmitt Trigger

Schmitt trigger is otherwise called regenerative comparator. In this comparator circuit a positive feedback is added. The input voltage Vi triggers the output Vo very time it exceeds certain voltage levels. These voltages are known as upper threshold voltage (V_{UT}) and lower threshold voltage V_{LT} . The difference between

There two threshold voltages ($V_{UT} – V_{LT}$) gives the hysteresis width.

$$V_{UT} = V_{ref} + (R_2 / (R_1 + R_2) * (V_{sat} – V_{ref})$$

V_{ref} - applied reference voltage

V_{sat} - saturation voltage of OP-AMP

R_1, R_2 - Voltage divider resistances

$$V_{LT} = V_{ref} – (R_2 / (R_1 + R_2) * (V_{sat} – V_{ref})$$

When input voltage is greater than V_{UT} , output goes to negative saturation and when input voltage is less than V_{LT} , output goes to positive saturation.

Design of Schmitt trigger

Given V_{UT} = 0.5V V_{LT} = -0.5V

$$V_{UT} = \frac{R_2}{R_1 + R_2} V_{sat}$$

$$V_{LT} = \frac{R_2}{R_1 + R_2} (-V_{sat})$$

Taking ± V_{sat} = ± 15V,

$$\frac{R_2}{R_1 + R_2} (15V)$$

$$0.5 = \frac{R_2}{R_1 + R_2} = 30$$

$$\frac{R_2}{R_2} = 29$$

$= R_1 = 29R_2$

Taking $R_2 = 1K\Omega$

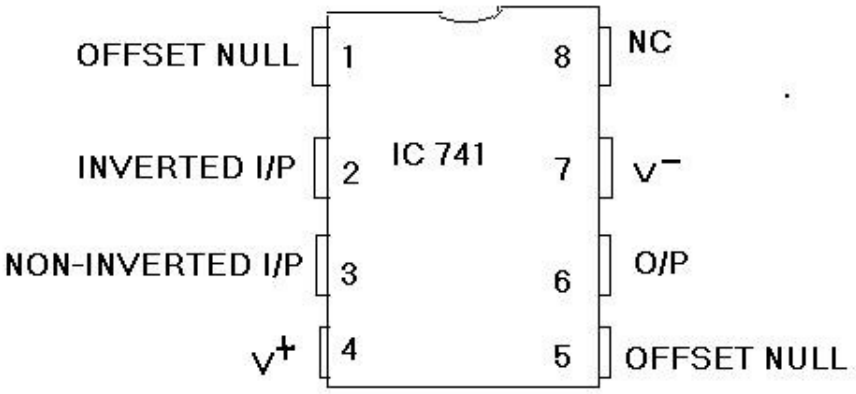
$R_1 = 29K\Omega$ (set using 100K POT)

PROCEDURE:

a) Schmitt trigger:

1. Connect the circuit as shown in diagram
2. See the input sine wave and output from pin.6 in a dual channel, CRO
3. Plot the observed waveforms in a linear graph.
4. Calculate the lower threshold voltage and upper threshold voltage from the plotted graph.
5. Calculate the lower threshold voltage and upper threshold voltage theoretically using the formula.

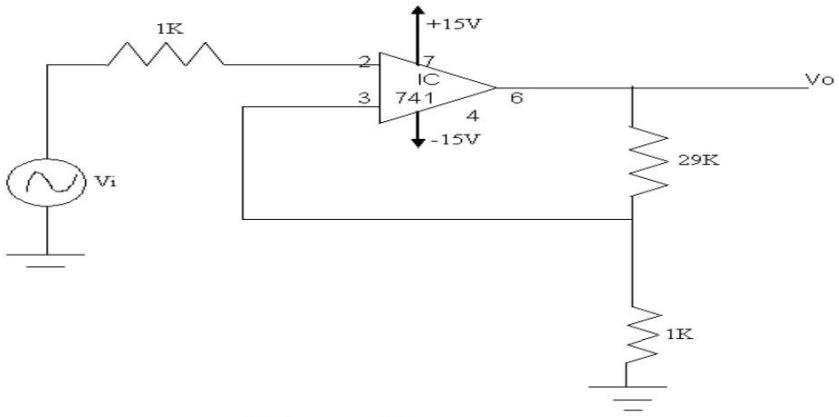
PIN DIAGRAM:

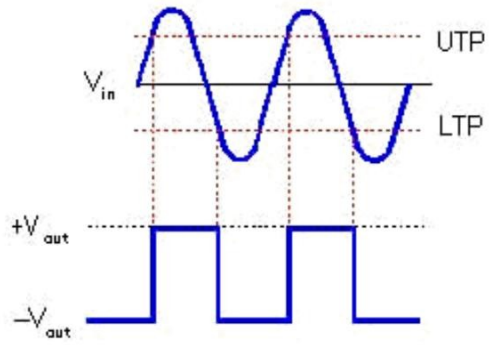


CIRCUIT DIAGRAM:

a)

Schmitt Trigger:





S.No:	INPUT		OUTPUT	
	Vin (V)	Time (msec)	Vout(V)	Time (msec)
1.	20	20	28	20

RESULT:

Thus Schmitt trigger and Wien bridge oscillator were designed and their operations were studied.