DESIGN OF SCHMITT TRIGGER USING TRANSISTOR

THEORY:

Schmitt trigger is a positive feedback comparator circuit. It is an extended version of Bistable Multivibrator. The only difference is that the collector terminal of transistor Q2 is not connected to base of transistor Q1. It is a square wave generator which converts sinusoidal signals into pulses.

When input is applied to the circuit, suppose transistor Q1 is OFF, which drives the output to $+V_{CC}$. This result in high voltage applied to the base of transistor Q2 which is turned ON. The output voltage at collector of Q2 is saturated and is equal to $V_{CE\ (SAT)}$. Now to turn ON transistor Q1 high voltage is required. As soon as input becomes equal to threshold value, it turns ON transistor Q1 and saturated to $V_{CE\ (SAT)}$. This is applied to the base of Q2 which turns OFF transistor Q2. The point where Q1 goes HIGH and Q2 goes low is called Upper Threshold Point (UTP).

Now the output remains in the ON state until the input higher than $V_{CE(SAT)}$. When it goes below this point then it is called Lower Threshold Point (LTP) and the output goes LOW. Thus, square wave pulses are generated from sinusoidal input signal. This helps in not responding to noise signals and improving the overall stability of the system. It resembles to hysteresis curve which responds to higher voltage rather than lower voltages.

SCHEMATIC DIAGRAM:

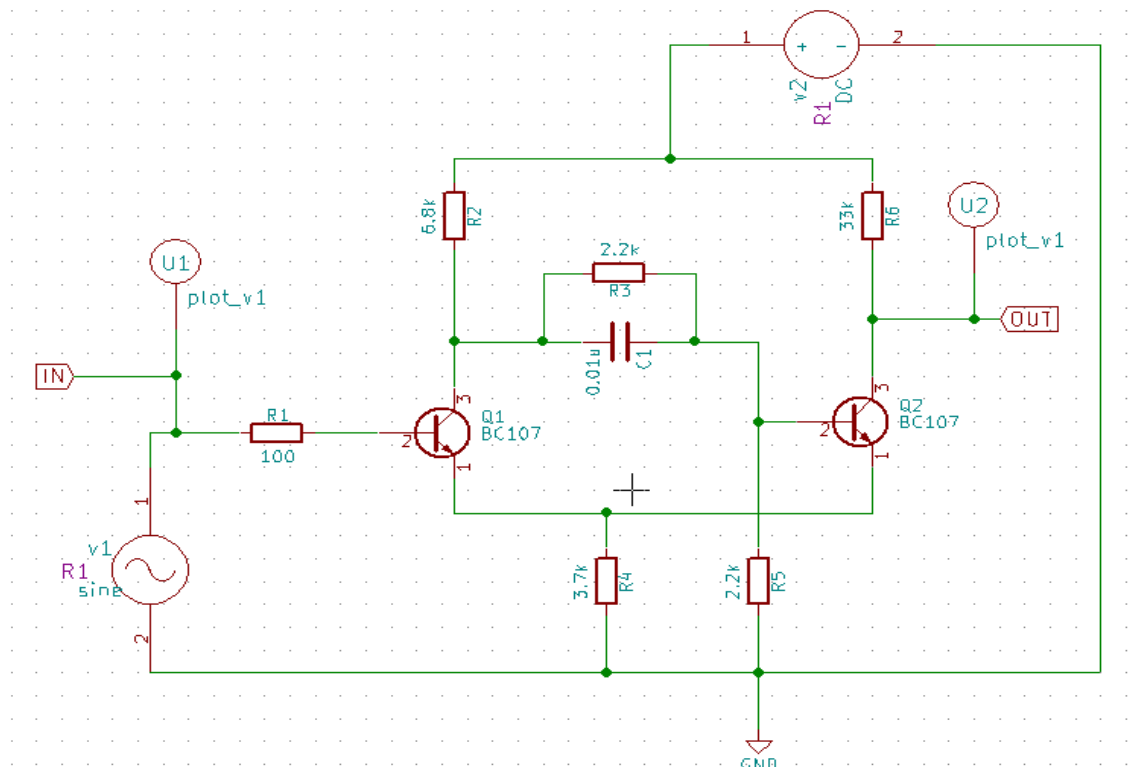The schematic circuit diagram of Schmitt Trigger is shown below:

Fig.1. Schmitt trigger circuit diagram
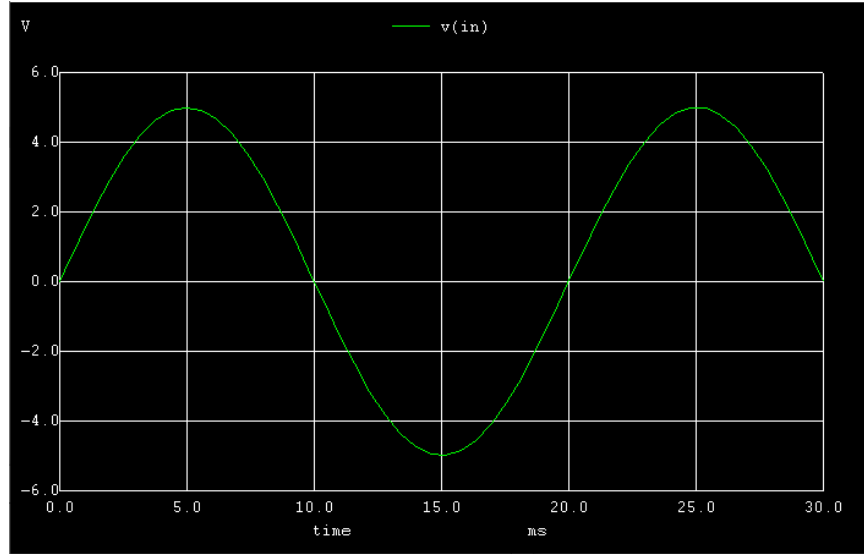
SIMULATION RESULTS

1. NgSpice Plots:

Input
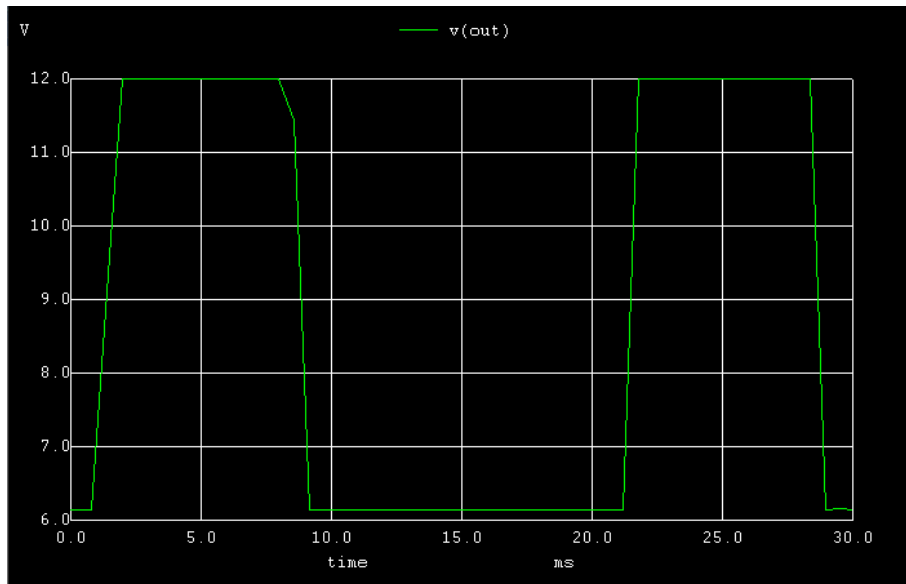

Fig.2. Input waveform NgSpice plot

Output

Fig.3. Output waveform NgSpice plot
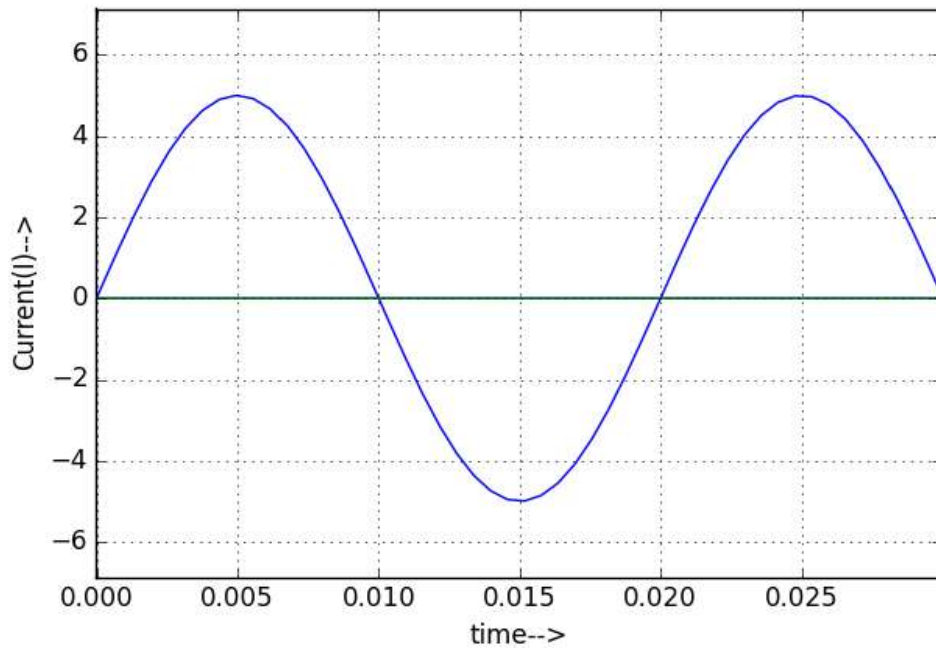
2. Python Plots:

Plot_v1 (IN)
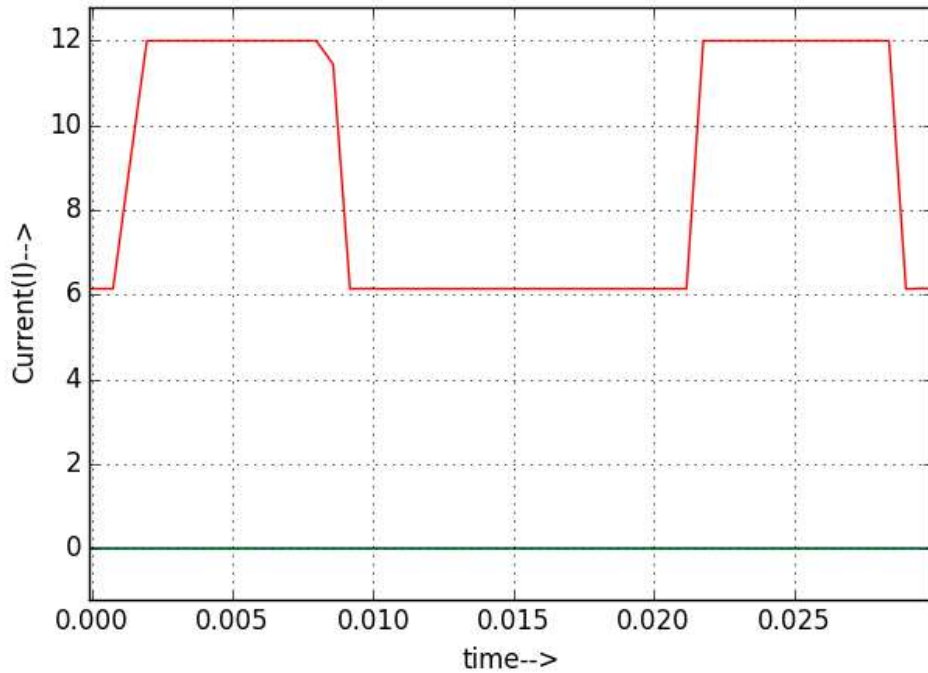

Fig.4. Input waveform Python plot

Plot_v2 (OUT)

Fig.5. Output waveform Python plot

CONCLUSION:

The design and analysis of Schmitt trigger has been successfully studied using BJT transistors with the help of eSim tool.

REFERENCES:

https://www.slideshare.net/MURUGANECE/ec-2-lab-manual-with-circulits