Design or describe a method to convert an input sine wave signal into an output square wave signal

Circuit diagram:

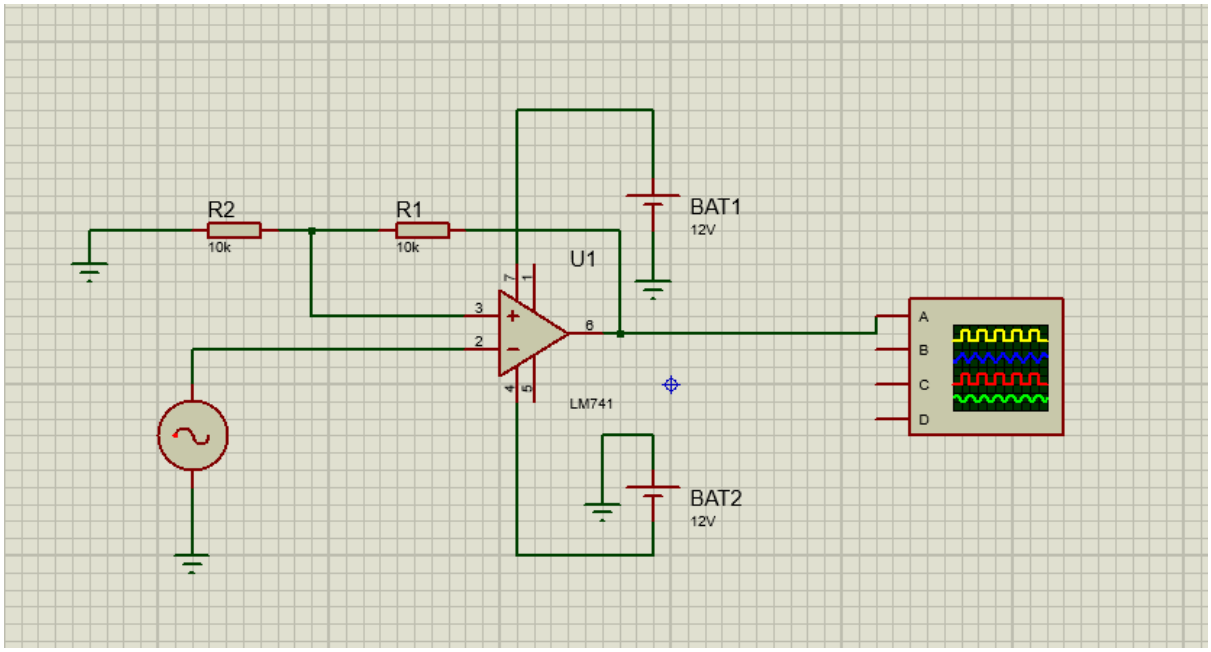

Fig: Inverting Schmitt trigger

Input sine wave :5V, 50Hz

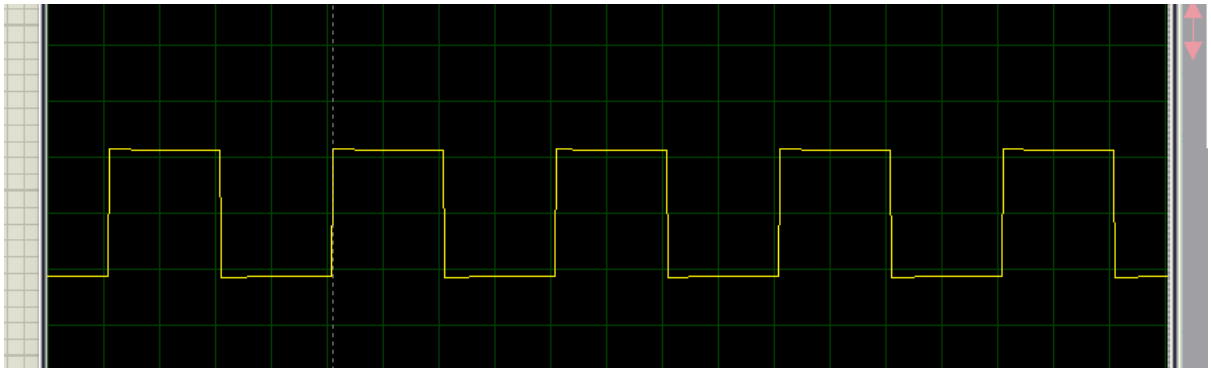

Fig: Inverting Schmitt trigger output

Schmitt trigger:

Schmitt trigger circuit is a type of comparator circuit with hysteresis. This hysteresis means it has two distinct threshold voltages—upper threshold voltage (V_{UT}) and lower threshold voltage (V_{LT}). The output of the Schmitt trigger changes states only when the input voltage crosses these thresholds, making it highly resistant to noise.

- **Upper Threshold (V_UT)**: The input voltage at which the output switches from low to high.
- **Lower Threshold (V_LT)**: The input voltage at which the output switches from high to low.

Upper Threshold Voltage (V_{UT}):

- $V_{UT} = \left(R_1 / \left(R_1 + R_f\right)\right) V_{sat}$

Lower Threshold Voltage (V_{LT}):

- $V_{LT} = -\left(R_1 / \left(R_1 + R_f\right)\right) V_{sat}$