Var-DC_Supply_SCR -- Overview

OBJECTIVES

After performing this lab exercise, learner will be able to:

- Control switching of SCRs by gate voltage
- Design, construct and test a DC voltage regulator using SCR
- Capture and display the signal from given Device Under Test (DUT)
- Measure RMS, MEAN and AREA measurements for regulated output

EQUIPMENT

To carry out this experiment, you will need:

- TBS1KB - Digital Oscilloscope from Tektronix
- Step-down Transformer (230V - 6V)
- SCR 2 (2P4M)
- Potentiometer 1M
- Resistors (10K)
- Diode (IN4001, BY127)
- Voltage probe (provided with oscilloscope) / BNC cables
- Breadboard and connecting wires

THEORY:

- The SCR is switched ON and OFF to regulate the output voltage in AC and DC voltage regulator.
- The transformer is used to step down the voltage from 230V to 6V. This is given as input to bridge rectifier.
- The bridge rectifier converts incoming ac signal to unidirectional wave. Therefore we get full wave rectifier output at the output of bridge rectifier. This is given as input to SCR. The gate of SCR is triggered with firing angle of α.
- With no triggering to the gate, the SCR will never turn on. Connecting the SCR gate to its own anode through a standard rectifying diode (to prevent reverse current through the gate in the event of the SCR containing a built-in gate-cathode resistor), will allow the SCR to be triggered almost immediately at the beginning of every positive half-cycle.

- We can delay the triggering of the SCR; however, by inserting some resistance into the gate circuit, thus increasing the amount of voltage drop required before enough gate current triggers the SCR. Increasing the resistance raises the threshold level, causing less power to be delivered to the load which is shown in figure 2. Decreasing the resistance lowers the threshold level, causing more power to be delivered to the load which is shown in figure 1.

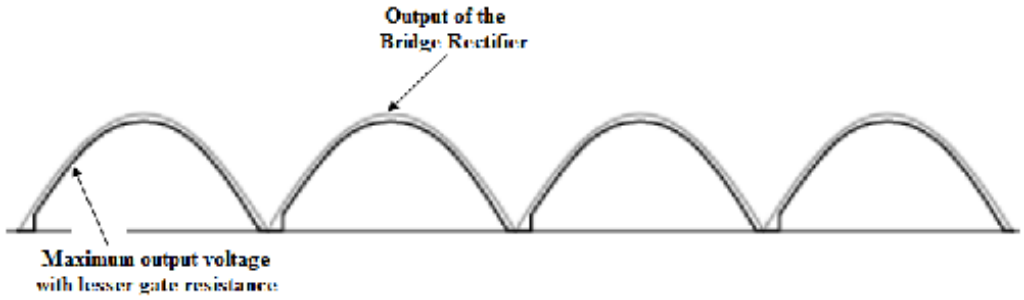


Fig.1. Maximum output voltage with lesser gate resistance

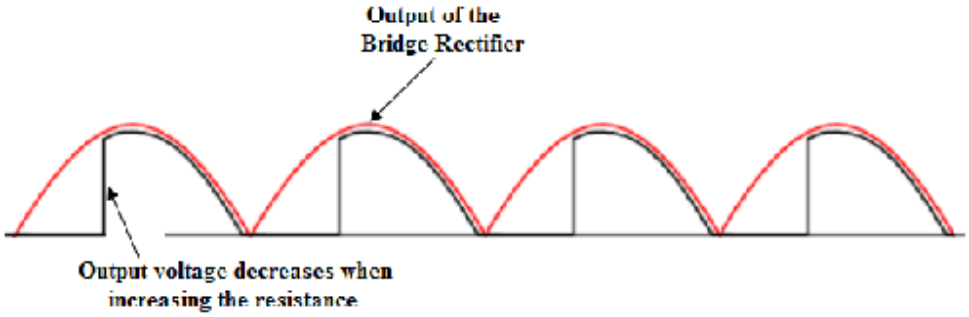
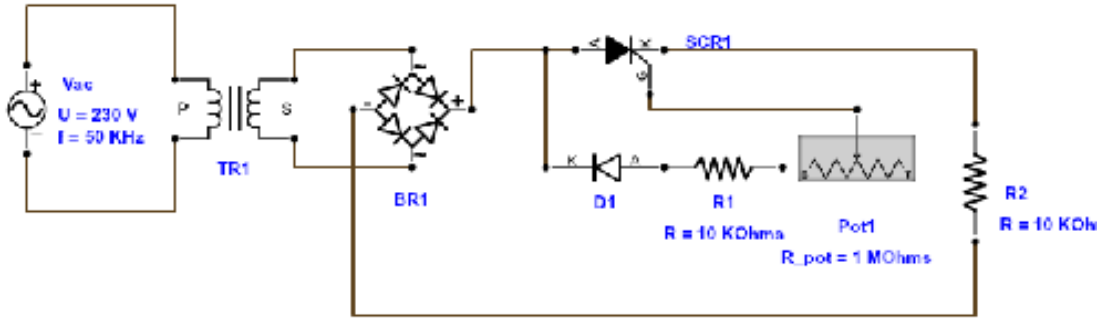


Fig.2. Output voltage decreases when adjusting the POT

CIRCUIT DIAGRAM:

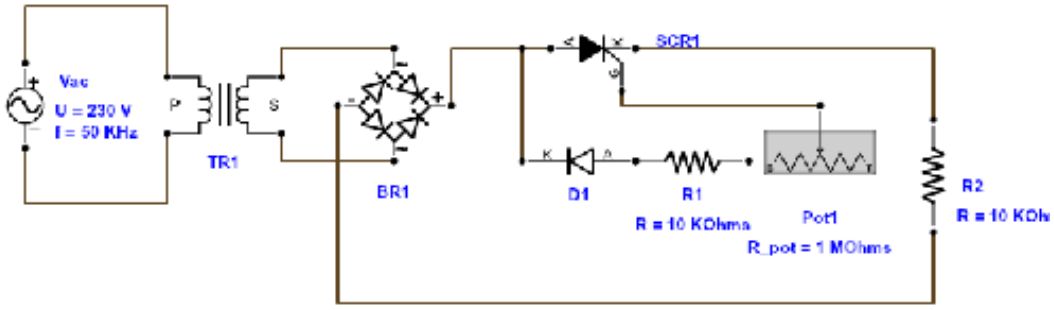


Var-DC_Supply_SCR -- Procedures

Step 1

SOURCE / DUT SETUP :

- Make the circuit as shown below



- Connect the two input terminals from the transformer to the input of the bridge rectifier.
- The output positive terminal of the bridge rectifier is connected to the anode terminal of the SCR and the negative terminal of the bridge rectifier is connected to the negative end of the load.
- The cathode terminal of the SCR is connected to the positive end of the load.
- Connect 10K-ohm resistor and 1M-ohm POT in series combination between the anode terminal and gate terminal of the SCR.

Step 2

MEASUREMENT SETUP

- Probe CH1 at anode of SCR (+ output of bridge rectifier)
- Probe CH2 at load resistance (output of regulator across R2)

Step 3

Switch on the power supply and capture both signals.

Step 4

Adjust the knob of 1M-ohm POT manually and check the output waveform of DC voltage according to the gate trigger pulse using DSO.

Step 5

MEASUREMENT CONFIGURATION

- Add RMS, AREA and MEAN measurement on CH2 (regulated output)
- Observe the variation in voltage measurements when you vary Potentiometer to control the SCR gating.
- Measure the phase angle at which SCR is turned on using cursors.

Step 6

Save the waveforms for different gate pulses in the external USB Pendrive.