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EXPERIMENT NO.: 7

Aim: To design bipolar junction transistor as a switch.

Equipments: NPN transistor, Power supply, multimeter, connecting wires, Multisim etc.

Theory:

Cut-off-Mode: In this mode, both collector base junction and emitter base junction are reverse biased. This in turn not allows the current to flow from collector to emitter when the base emitter voltage is low. In this mode device is completely switched off as the result the current flowing through the device is zero.

Saturation Mode: In this mode of operation, both the emitter base and collector base junctions are forward biased current flows freely from collector to emitter when the Base emitter voltage is high. In this mode device is fully switched ON. The figure shows the output characteristics of a BJT transistor. In the below figure cut off region has the operating condition as zero collector output current, zero base input current and maximum collector voltage. These parameters cause a large depletion layer which further doesn't allow current to flow through the transistor therefore, the transistor is completely in OFF condition.

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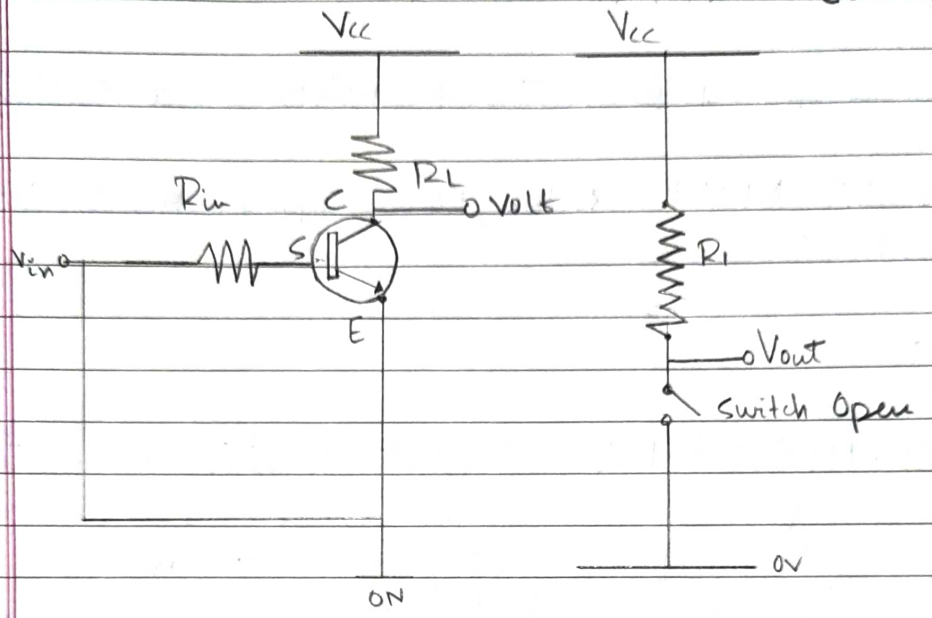
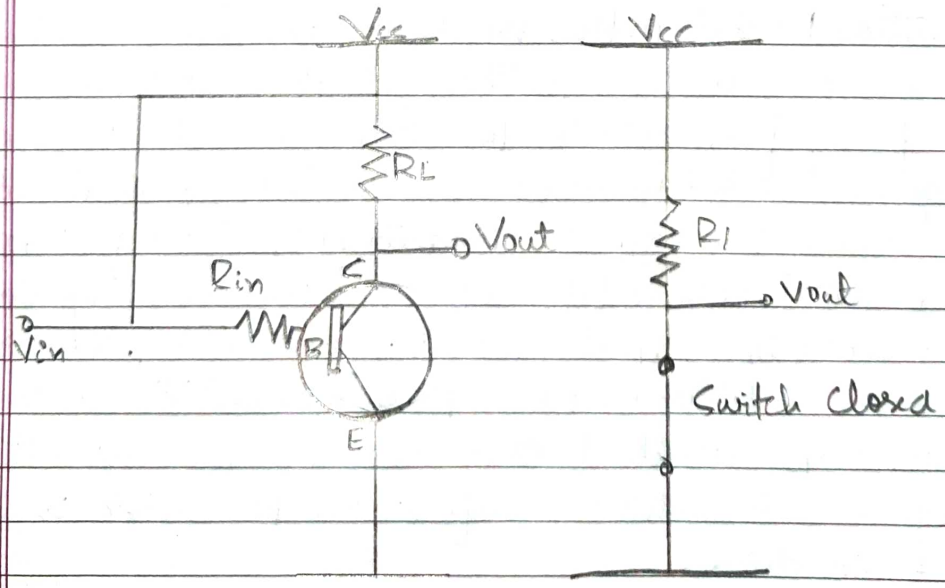
Cut-off-Mode:



Saturation Mode:



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Procedure:

1.) Design the circuit as per the diagram on Multisim.

2.) Connect the power supply as per the circuit diagram.

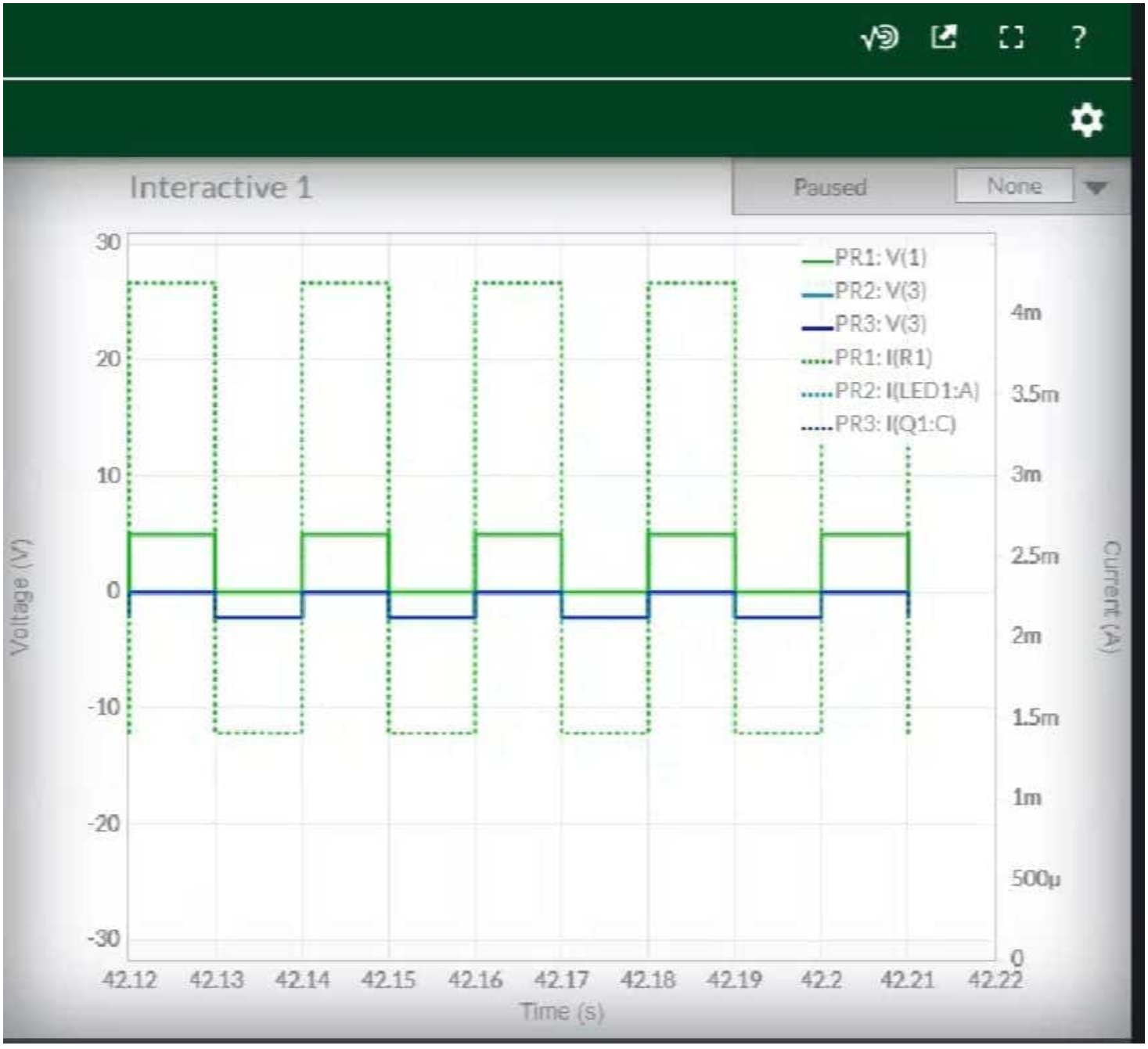
3.) Measure the values of current and voltage through the circuit.

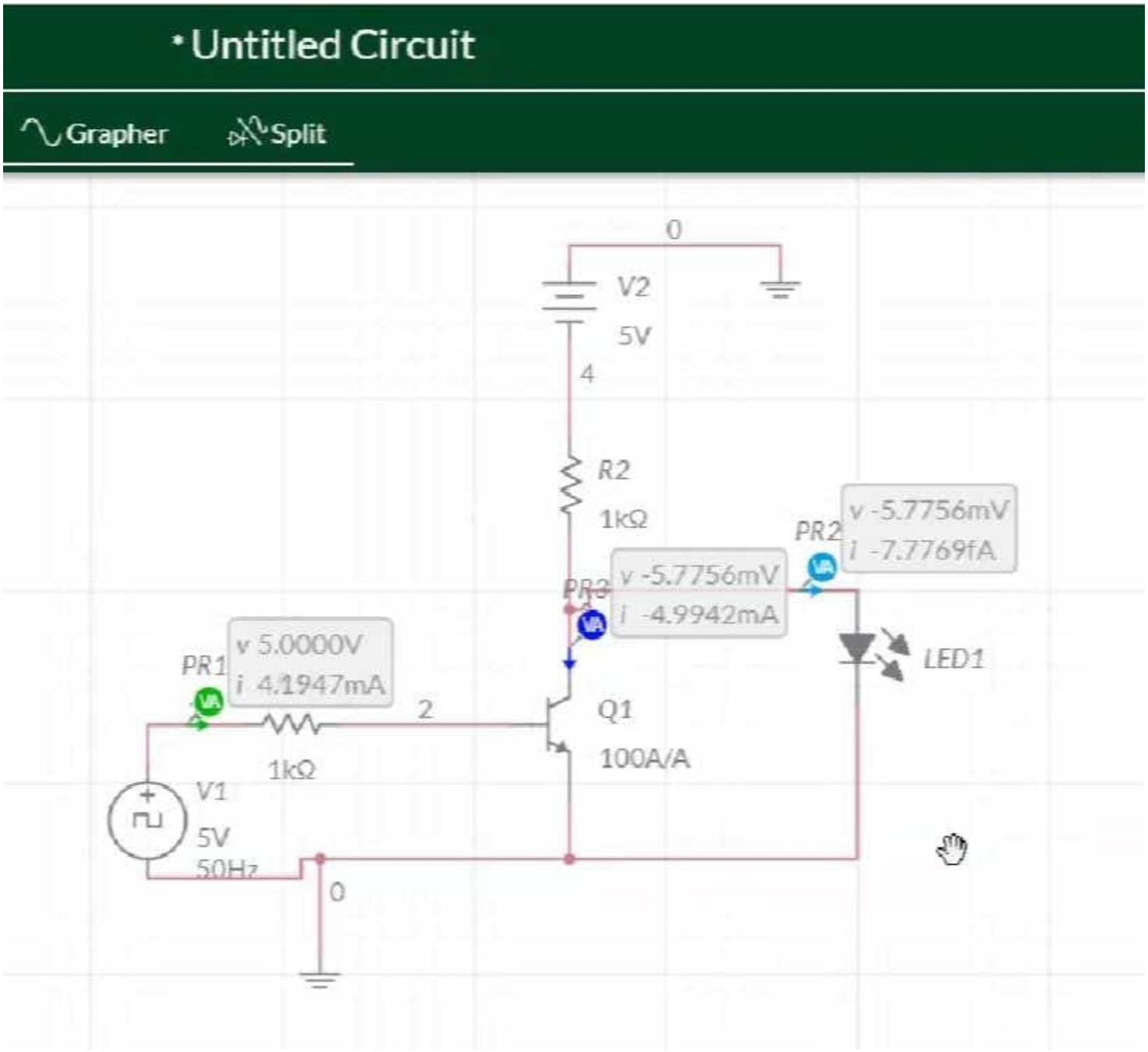
4.) Draw the output graph.

Observations:

Sr No.	V_{rms}	I_{rms}
1.)	5.00 V	4.194 mA
2.)	-5.774 mA	-4.994 mA
3.)	-5.77 mV	-7.776 FA

Conclusion: From the observation table we have, we can literally conclude that the transistor could be used as switch element to control DC power to load. The switched current goes between emitter and collector the controlling current goes between emitter and base.


Interactive 1
Paused
None
PR1: V(1)
PR2: V(3)
PR3: V(3)
PR1: I(R1)
PR2: I(LED1:A)
PR3: I(Q1:C)
30
20
10
0
-10
-20
-30
Voltage (V)
4m
3.5m
3m
2.5m
2m
1.5m
1m
500µ
0
Current (A)
42.12
42.13
42.14
42.15
42.16
42.17
42.18
42.19
42.2
42.21
42.22
Time (s)


• Untitled Circuit
Grapher
Split
0
V2
5V
4
R2
1kΩ
v -5.7756mV
i -7.7769fA
PR2
v -5.7756mV
i -4.9942mA
PR3
v 5.0000V
i 4.1947mA
PR1
LED1
2
Q1
100A/A
1kΩ
V1
5V
50Hz
0