University of Anbar
College of Engineering
Dept. of Electrical Engineering

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Experiment no.: ٣
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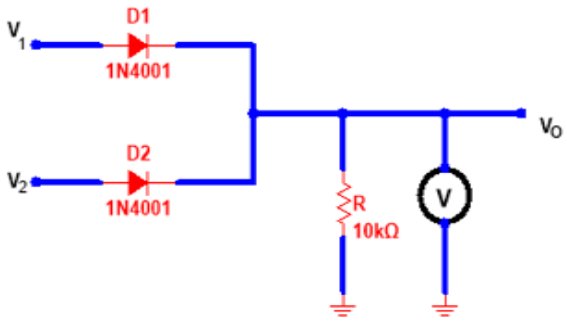
Experiment #3- Part#3

Logic Gate Circuits

Procedure

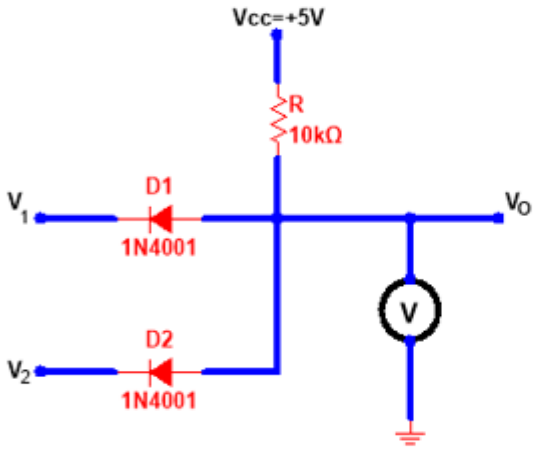
1. Connect the OR gate circuit shown in Fig.12 and verify its operation.



V_1	V_2	V_o
0V	0V	
0V	5V	
5V	0V	
5V	5V	

Figure 12: Practical OR Gate circuit

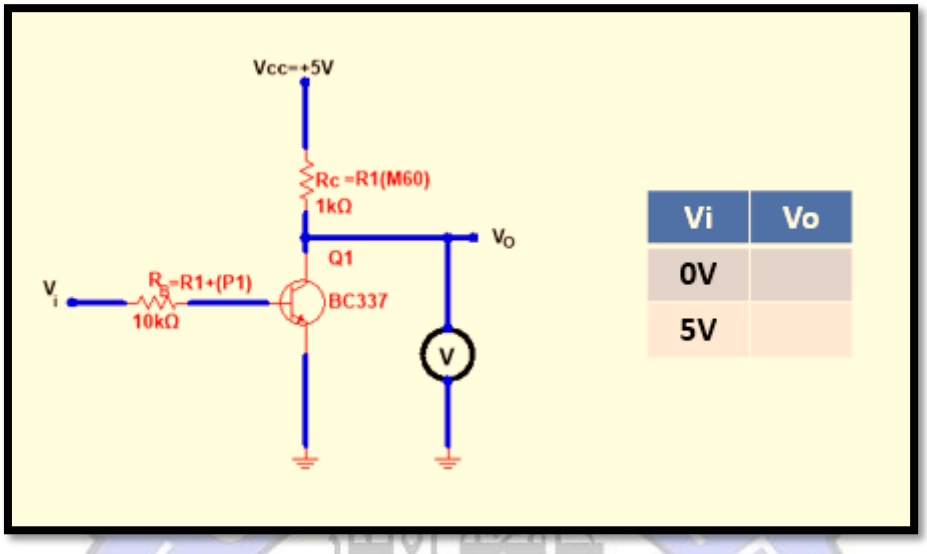
2. Connect the AND gate circuit shown in Fig.13 and verify its truth table.



V_1	V_2	V_o
0V	0V	
0V	5V	
5V	0V	
5V	5V	

Figure 13: Practical AND Gate Circuit

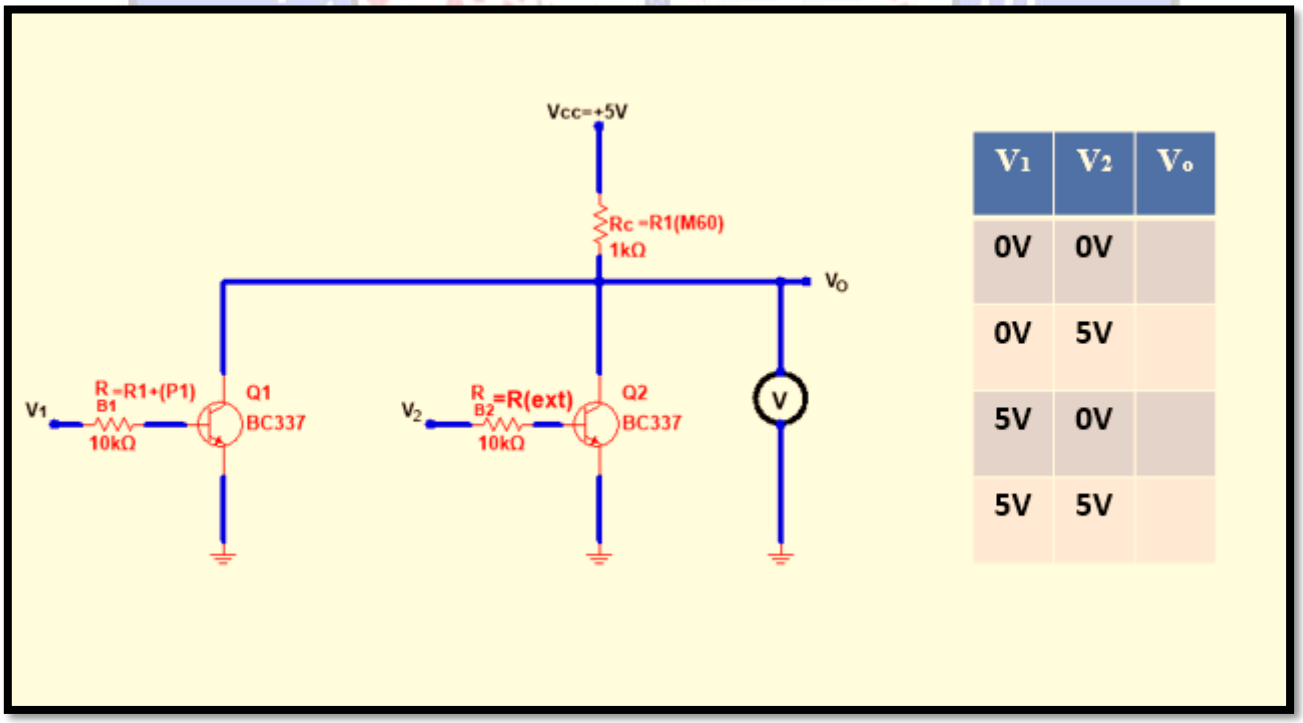
3. Connect the inverter circuit shown in Fig.14 and verify its operation. When Vi = 5V (HIGH), try to measure V_{BE} and V_{CE} of the transistor at saturation.



Vi	Vo
0V	
5V	

Figure 14: Practical Inverter Circuit

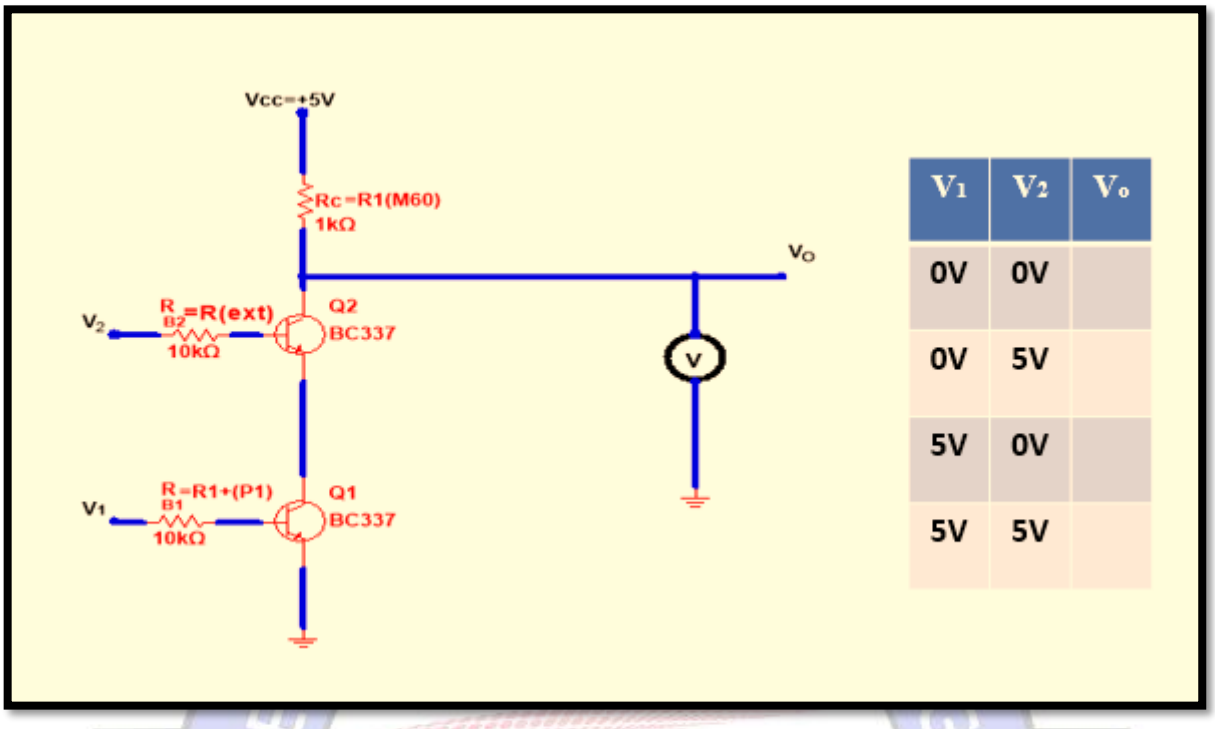
4. Connect the NOR gate circuit shown in Fig.15 and verify its truth table.



V1	V2	Vo
0V	0V	
0V	5V	
5V	0V	
5V	5V	

Figure 15: Practical NOR Gate Circuit

5. Connect the NAND gate circuit shown in Fig.16 and verify its truth table.

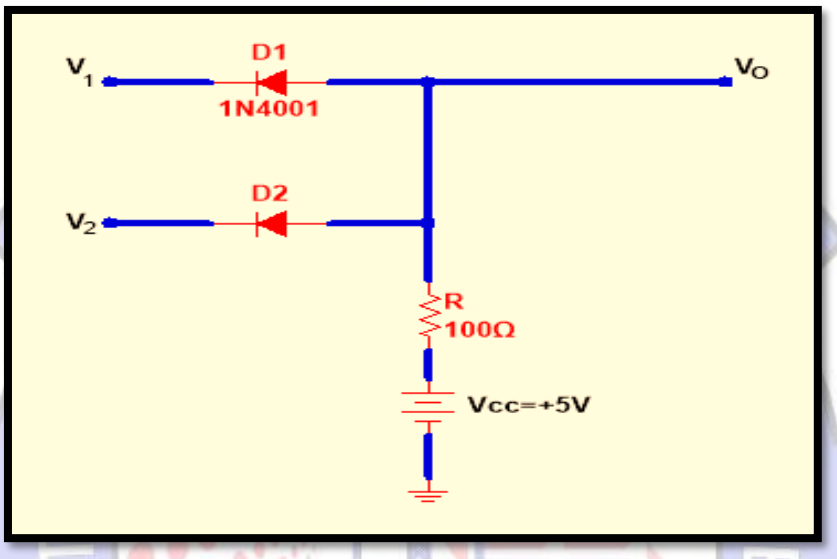


V_1	V_2	V_o
0V	0V	
0V	5V	
5V	0V	
5V	5V	

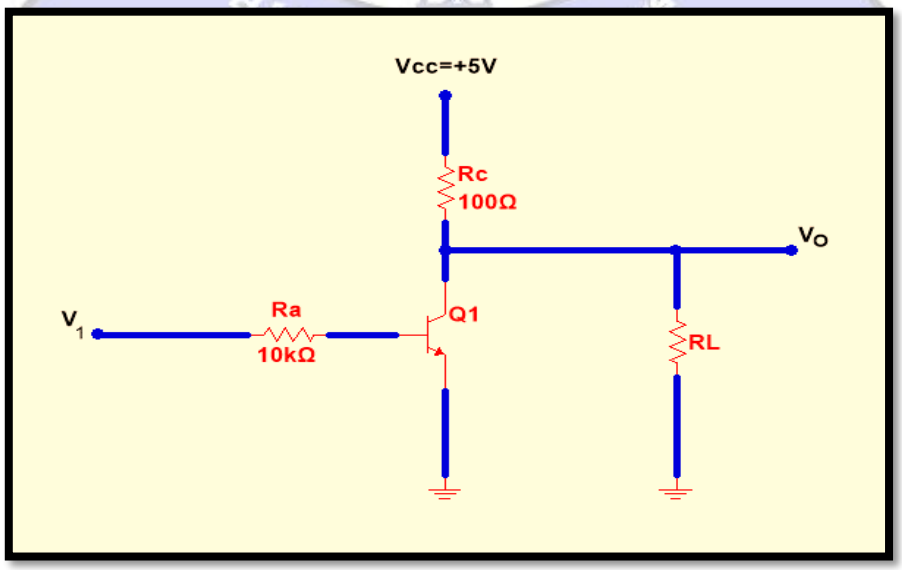
Figure 16: Practical NAND Gate Circuit

Discussion

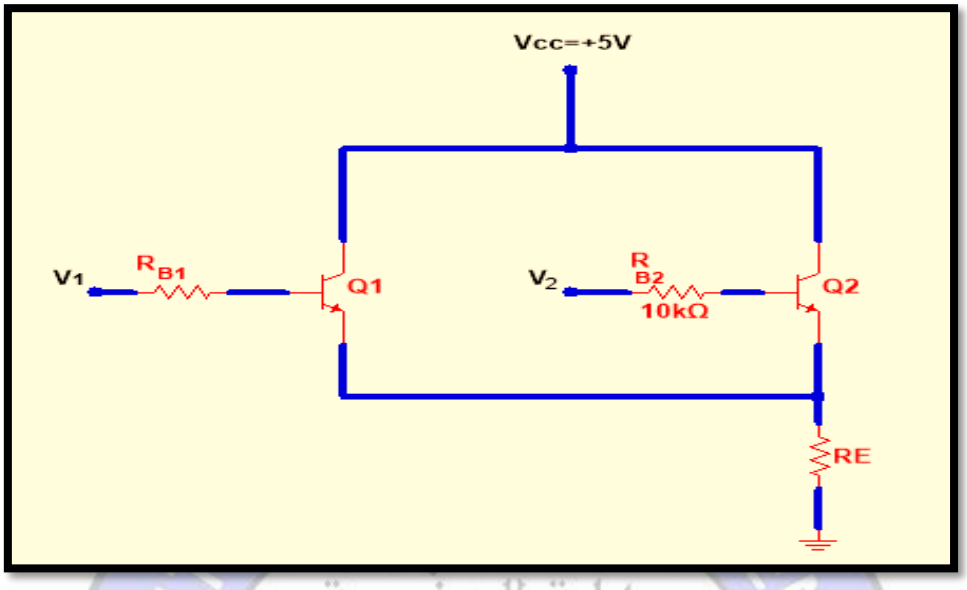
1. Determine the current flowing in each diode in the practical OR logic circuit of Fig.12 when both inputs are HIGH (5V).
2. What is the maximum current rating that each diode should have in the logic circuit shown below? Assume that the voltage drop across the silicon diode is 0.7V when it conducts.



3. For the inverter circuit of Fig.14, prove that the transistor is working deeply in saturation when Vi = 5V. Assume that β = 150 for the BC107 NPN transistor.
4. In the logic circuit shown below, what is the minimum RL that the inverter can drive without causing the output to drop below 4V when Vi = 0V?



5. What is the function of the digital circuit shown below? Describe its operation briefly and find its truth table.



6. Design a NAND Gate digital circuit using an AND gate and an inverter. Describe the operation of the circuit.
7. Design a NOR gate circuit using an OR gate circuit and an inverter. Describe briefly the operation of the circuit.
8. Determine the truth table of the digital circuit shown in the figure below and explain its operation.