Mapúa Institute of Technology at Laguna
Malayan Colleges Laguna

ECE101-1L – FUNDAMENTALS OF ELECTRONIC CIRCUITS (LAB)

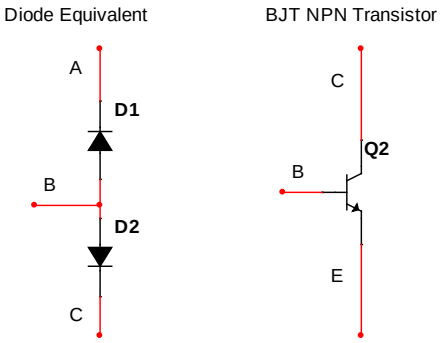
Activity #4 and 5: Transistor Familiarization and Application

Objectives:

- Use an Ohmmeter to differentiate between NPN and PNP transistors and to perform operational testing.
- Demonstrate the operation and biasing of a transistor under quiescent conditions.
- Demonstrate how to create and interpret transistor load lines.

Procedures:

1. Open Multisim
2. Create the circuit shown below



3. Using a multimeter (Ohmmeter Setting)
   a. Connect the Multimeter Probe (+) to B terminal of Diode Equivalent Circuit and Probe (-) to A terminal. Screenshot the Multimeter Reading.

   _____

   b. Connect the Multimeter Probe (+) to B terminal of BJT Transistor Circuit and Probe (-) to C terminal. Screenshot the Multimeter Reading.

   _____

   c. Repeat the method used in a and b to complete the table:

Diode Equivalent Circuit		
Probe (+)	**Probe (-)**	**Multimeter Reading**
A	B	
B	C	
B	A	
C	B	

BJT NPN Transistor		
Probe (+)	**Probe (-)**	**Multimeter Reading**
B	C	
B	E	
C	B	
E	B	

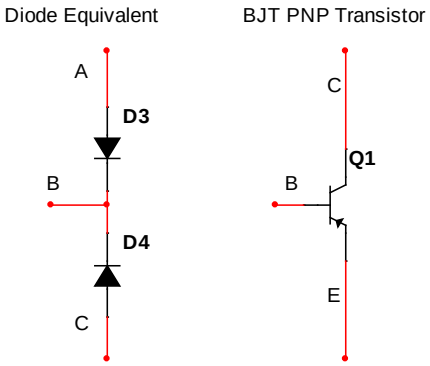
   d. Base on the measurements above compare and discuss the operation of both circuit

   _____

   _____

Prepared by: Jonathan R. Oracion

4. Create the circuit shown below



5. Using a multimeter (Ohmmeter Setting)
   a. Connect the Multimeter Probe (+) to B terminal of Diode Equivalent Circuit and Probe (-) to A terminal. Screenshot the Multimeter Reading.

   _____

   b. Connect the Multimeter Probe (+) to B terminal of BJT Transistor Circuit and Probe (-) to C terminal. Screenshot the Multimeter Reading.

   _____

   c. Repeat the method used in a and b to complete the table:

Diode Equivalent Circuit		
Probe (+)	**Probe (-)**	**Multimeter Reading**
A	B	
B	C	
B	A	
C	B	

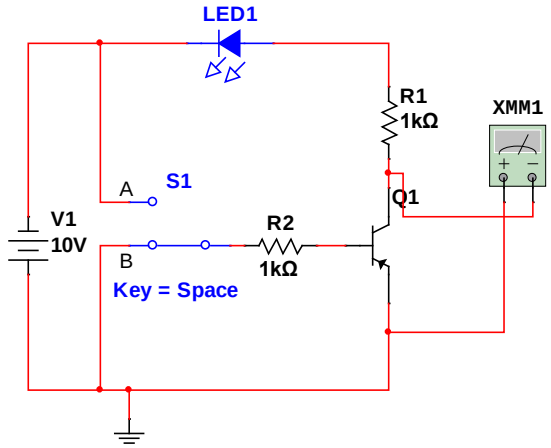
BJT PNP Transistor		
Probe (+)	**Probe (-)**	**Multimeter Reading**
B	C	
B	E	
C	B	
E	B	

   d. Base on the measurements above compare and discuss the operation of both circuit

   _____

   _____

6. Create the circuit shown below



7. Run the Simulation, set the multimeter to Voltmeter settings
   a. At S1 at B position what is the Voltage reading in the multimeter

      _____

   b. By checking the voltage reading and the LED status. Is the circuit conducting or is there a current flowing through the LED?

      _____

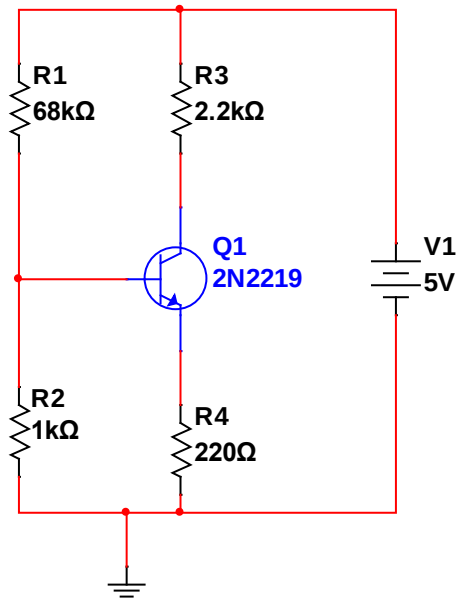
   c. Set S1 at A position what is the Voltage reading in the multimeter

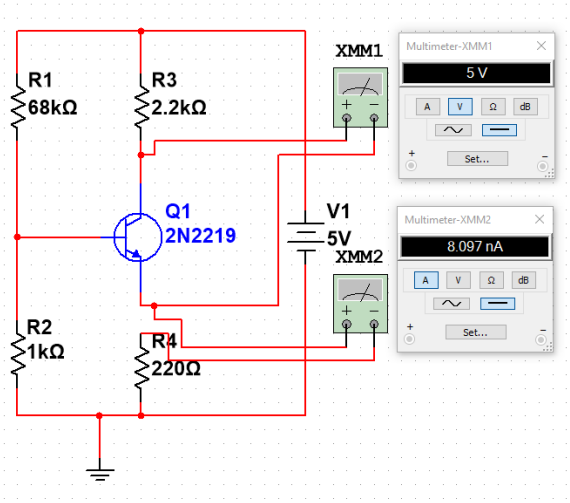
      _____

   d. By checking the voltage reading and the LED status. Is the circuit conducting or is there a current flowing through the LED?

      _____

8. Create the circuit shown below
9. Place a Multimeter to Measure the
   a. Voltage Across the Transistor (VCE) and
   b. Current flowing through the emitter (Ie)





10. Change the Value of R2 and complete the table shown below.

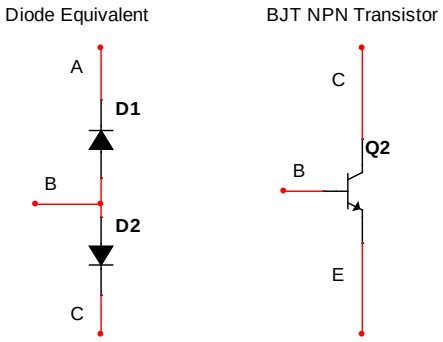
R2(KΩ)	V_{CE}	I_E
1		
2		
5		
8		
15		
18		
20		
25		
30		

11. Use MSEXCEL or any spreadsheet software to graph the points (Scatter Plots)
    VCE at horizontal axis and IE at vertical axis

    _____

    _____

12. Using TinkerCAD
13. Create the circuit shown below



14. Using a multimeter (Ohmmeter Setting)
    a. Connect the Multimeter Probe (+) to B terminal of Diode Equivalent Circuit and Probe (-) to A terminal. Screenshot the Multimeter Reading.

    _____

    b. Connect the Multimeter Probe (+) to B terminal of BJT Transistor Circuit and Probe (-) to C terminal. Screenshot the Multimeter Reading.

    _____

    c. Repeat the method used in a and b to complete the table:

Diode Equivalent Circuit		
Probe (+)	**Probe (-)**	**Multimeter Reading**
A	B	
B	C	
B	A	
C	B	

BJT NPN Transistor		
Probe (+)	**Probe (-)**	**Multimeter Reading**
B	C	
B	E	
C	B	
E	B	

    d. Base on the measurements above compare and discuss the operation of both circuit

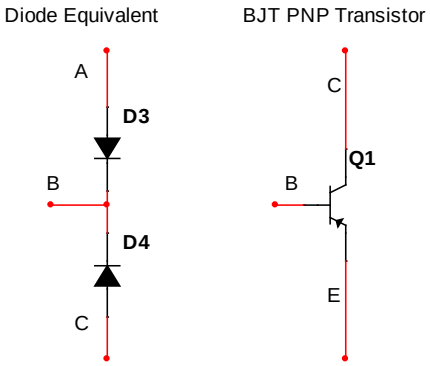
    _____

    _____

    e. Does your TinkerCAD and Multisim simulation generate similar results?

    _____

15. Create the circuit shown below



16. Using a multimeter (Ohmmeter Setting)
    a. Connect the Multimeter Probe (+) to B terminal of Diode Equivalent Circuit and Probe (-) to A terminal. Screenshot the Multimeter Reading.

    _____

    b. Connect the Multimeter Probe (+) to B terminal of BJT Transistor Circuit and Probe (-) to C terminal. Screenshot the Multimeter Reading.

    _____

    c. Repeat the method used in a and b to complete the table:

Diode Equivalent Circuit		
Probe (+)	**Probe (-)**	**Multimeter Reading**
A	B	
B	C	
B	A	
C	B	

BJT PNP Transistor		
Probe (+)	**Probe (-)**	**Multimeter Reading**
B	C	
B	E	
C	B	
E	B	

    d. Base on the measurements above compare and discuss the operation of both circuit

    _____

    _____

    e. Does your TinkerCAD and Multisim simulation generate similar results?

    _____

Discussions:

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