1. What would happen if a wire with very little resistance was connected directly across the terminals of a 6-volt battery? Explain in your answer in terms of basic electrical circuit theory.

![Figure 1](image)

2. Consider the circuit below:

![Figure 2](image)

Describe the output voltage $V_{out}$ when $R_a = 1\text{K}\Omega$ and $R_b$ is:

a. Very small
b. Very large

3. Determine the four voltmeter values $A$, $B$, $C$ and $D$ that will register connected to the circuit as shown. Assume that battery voltage is 5V. Provide enough explanation for your answer.

![Figure 3](image)
4. For Figure 4, the resistors that are in parallel with each other are:
   a. R2 and R4
   b. R1 and R3
   c. Both R2 and R4 along with R1 and R3
   d. R1 and (R2 + R3 + R4)
   e. None of the above

5. For Figure 4, if Req = 100 Ohms and Vs = 10V, the current leaving the voltage source must be:
   a. 1000A
   b. 1000W
   c. 0.1A
   d. 0.1W
   e. None of the above

6. For Figure 4, Vs = 5V, R1 = 100 Ohms, R2 = 100 Ohms, R3 = 150 Ohms, R4 = 50 Ohms. Find the power dissipated by resistor R3.

7. Define the term power rating.

8. To stop the servo motor on the Boe-Bot from turning, you should program the Boe-Bot to send a pulse width of ________ ms.

9. Assume that the BoeBot is moving through a room and there are certain instances where it must wait for 4 seconds before it can do anything. What commands will you need to perform so that BoeBot does not perform any action for 4 seconds?

10. Infer the type of variable x:
    \[ x = !x \&\& (x == false); \]

11. What is the value of variable x after the following code snippet is executed:

    ```
    int x = 4;
    if (x > 0)
        x = x + 10;
    x = x - 5;
    if (x <= 0)
        x = 50;
    else
        x = x * 10;
    ```
12. Using parentheses, show how Java will interpret the expressions below:
   a. \( \frac{2}{3} \% 4 + 8 \)
   b. \( \text{true} \&\& \text{true} || \text{false} \)

13. Consider the valid expression below. Circle what best describes the value of the expression.
   a. \( i \times i \geq i \) where \( i \) is a variable of type int
      
      true  false  depends
   b. \( p \lor !p \) where \( p \) is a boolean variable
      
      true  false  depends

14. What is the outcome when the following code is executed?

   ```java
   int val = 5;
   for(int i = 5; i > 0; i--){
      for(int j = 1; j <= i; j++){
         System.out.print(i);
      }
   } System.out.println(" ");
   }
   ```

15. Write a static method called “max” that compares three integers and returns the largest of the three integers. Assume the method is written in class M.
   Examples:
   max(1, 2, 3) returns 3
   max(5, 5, 5) returns 5
   max(-1, 0, -2) returns 0