Title: **More Wheatstone Bridge** Worksheet: 19

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 66pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

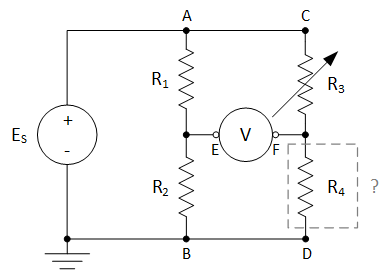
1. Student shall determine the value of an unknown resistance given a Wheatstone bridge.
2. Student shall analyze that value of a Wheatstone bridge in appropriate field applications.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Worksheet. Grading shall be based on an answer key.

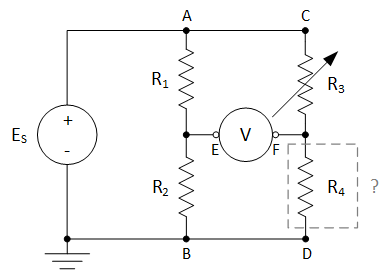
**Theory**

A Wheatstone bridge is an electrical circuit used to measure an unknown electrical resistance by balancing two legs of a bridge circuit, one leg is composed of two known resistance values while the other leg typically includes an adjustable resistor and an unknown resistance. The primary benefit of the circuit is its ability to provide extremely accurate measurements.



To determine the value of the unknown resistance, a voltage measurement circuit is placed across the bridge. If a voltage is present, the bridge is said to be “unbalanced”. The value of R3 is adjusted until no potential difference exists across the bridge. Once no voltage is detected between points E and F, the circuit is said to be balanced. It is then possible to determine the value of the unknown resistance.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |



**Instructions**

Using the formulas on the previous page and the given values above, complete the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 3.667mA | 3.3kΩ | 12.1V |
| R2 |  | 2.7kΩ | 9.9V |
| R3 |  | 60.115mA | 288Ω | 17.313V |
| R4 |  | 77.968Ω | 4.687V |
| Total |  |  |  | 22V |

Calculate the value that R3 would need to be adjusted to obtain a balanced bridge circuit.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 3.667mA | 3.3kΩ | 12.1V |
| R2 |  | 2.7kΩ | 9.9V |
| R3 |  | 126.976mA | 95.293Ω | 12.1V |
| R4 |  | 77.968Ω | 9.9V |
| Total |  |  |  | 22V |

Using the formulas on the previous page and the given values above, complete the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 168.75μA | 100kΩ | 16.875V |
| R2 |  | 220kΩ | 37.125V |
| R3 |  | 19.674mA | 720Ω | 14.165V |
| R4 |  | 2.025kΩ | 39.835V |
| Total |  |  |  | 54V |

Calculate the value that R3 would need to be adjusted to obtain a balanced bridge circuit.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 168.75μA | 100kΩ | 16.875V |
| R2 |  | 220kΩ | 37.125V |
| R3 |  | 18.335mA | 920.361Ω | 16.875V |
| R4 |  | 2.025kΩ | 37.125V |
| Total |  |  |  | 54V |

Using the formulas on the previous page and the given values above, complete the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 5.517mA | 1.8kΩ | 9.931V |
| R2 |  | 1.1kΩ | 6.069V |
| R3 |  | 13.465mA | 820Ω | 11.041V |
| R4 |  | 368.297Ω | 4.959V |
| Total |  |  |  | 16V |

Calculate the value that R3 would need to be adjusted to obtain a balanced bridge circuit.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 5.517mA | 1.8kΩ | 9.931V |
| R2 |  | 1.1kΩ | 6.069V |
| R3 |  | 16.478mA | 820Ω | 9.931V |
| R4 |  | 368.297Ω | 6.069V |
| Total |  |  |  | 16V |