Title: **Voltage Referencing** Worksheet: 7

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade \_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall distinguish voltage readings as it pertains to a specific reference point.
2. Student shall formulate that the same voltage may be positive or negative depending on the reference point.

**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.

**Circuit**

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

Where;

**Theory**

Establishing a point of reference when taking voltage readings is a common practice. In the drawing above, the three dashed lines of diminishing lengths (attached to point “D”) is the symbol for *ground*, or in this exercise, the reference point. If a voltage reading denotes only one subscript letter to indicate the measurement, the reading is from that point to ground. For example, the reading EA would refer to the voltage from point “A” to the reference point, in this case ground. The *polarity* of the reading is important as well. Since point “A” is of a higher potential than the reference point, the voltage reading EA will be positive. If the measurement stated EE, the reading would be negative since point “E” is of a lower potential than the reference point.

**Instructions**

Refer to the schematic on the previous page. Using the Ohm’s Wheel, solve for total resistance, then total current and finally the individual voltages across each resistor and record your calculations in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 500mA | 25Ω | 12.5V |
| R2 |  | 500mA | 45Ω | 22.5V |
| R3 |  | 500mA | 65Ω | 32.5 |
| R4 |  | 500mA | 120Ω | 60 |
| R5 |  | 500mA | 45Ω | 22.5 |
| Total |  | 500mA | 300Ω | 150V |

Using the calculations above, compute the voltage reference values below. Remember to pay attention to polarity with respect to the point of reference. It is possible to have a negative voltage reading.

EA 67.5V EB 55V EC 32.5 ED 0V EE -60V EF -82.4V

Now we shall move the reference point to establish the effects it will have on our readings. Refer to the schematic below and using the values from the table above, recalculate the referenced voltage readings.



EA 12.5V EB 0V EC -22.5V ED -55V EE -115V EF -137.5V

**Circuit**



Where;

**Instructions**

Refer to the schematic above. Complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 32.051mA | 150Ω | 4.808V |
| R2 |  | 32.051mA | 190Ω | 6.090V |
| R3 |  | 32.051mA | 120Ω | 3.846V |
| R4 |  | 32.051mA | 240Ω | 7.692V |
| R5 |  | 32.051mA | 80Ω | 2.564V |
| Total |  | 32.051mA | 780Ω | 25V |

Using the calculations above, compute the voltage reference values below. Remember to pay attention to polarity with respect to the point of reference. It is possible to have a negative voltage reading.

EA 10.898V EB 6.090V EC 0V ED -3.846V EE -11.538V EF -14.102V

**Theory**

Voltage references may also refer to individual points (not a common reference point) for the reading. For instance, in the schematic below if someone wanted the voltage across both R2 and R3, the measurement would be termed EBD since those two points encompass the voltages of R2 and R3. Again, polarity is important. Since point “B” is of a higher potential than point “D”, this voltage reading will be positive. If the measurement stated EBA, the reading would be negative since point “B” is of a lower potential than point “A”.

**Circuit**



Where;

**Instructions**

Refer to the schematic above. Complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  | 75.758mA | 50 | 3.788V |
| R2 |  | 75.758mA | 90 | 6.818V |
| R3 |  | 75.758mA | 200 | 15.151V |
| R4 |  | 75.758mA | 140 | 10.606V |
| R5 |  | 75.758mA | 180 | 13.636V |
| Total |  | 75.758mA | 660 | 50V |

Using the calculations above, compute the voltage readings below.

EAC 10.606V EBD 21.969V ECF 39.393V EDA -25.757V EEA -36.363V EFE -50