Title: **Combination Parallel-Series Circuits** Lab: 12

Course: Electrical Applications Unit: Electrical Lab CLO: 2, 3, 4

Name ANSWER KEY Grade 60pts Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall calculate combination parallel-series circuit quantities using the characteristics of a parallel and a series circuit.
2. Student shall apply the conductance method of determining total resistance.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Lab. Grading shall be based on instructor evaluation.

**Materials**

|  |  |
| --- | --- |
| Student Provided Materials | Department Provided |
| Proto-Board | Power Supply |
| Multimeter |  |
| Resistor Kit |  |
| Calculator |  |

**Theory**

A combination circuit is a configuration that mixes components connected in series as well as components connected in parallel. A combination circuit has two major schemes, series-parallel and parallel-series. This lab will focus on the latter.

A parallel-series circuit is a circuit whose major circuit is a parallel configuration, that has one or more branch circuits that has components connected in series. To solve a parallel-series circuit, solve each branch in the major circuit. Each branch could contain multiple series connected components. In this case, series circuit rules apply. Once individual branch circuits are calculated, the totals for the major circuit can be computed using the individual branch calculations.

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

**Circuit**



Where;

**Instructions**

Calculations

1. Compute the following values based on the Ohm’s Wheel and the given information.

RAB= 1.68kΩ, RCD = 13.63kΩ, IAB = 6.845mA, ICD = 843.727μA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 | 46.857mW | 6.845mA | 1kΩ | 6.845V |
| R2 | 31.863mW | 680Ω | 4.655V |
| R3 | 7.119mW | 843.727μA | 10kΩ | 8.437V |
| R4 | 234.919μW | 330Ω | 278.43mV |
| R5 | 2.349mW | 3.3kΩ | 2.784V |
| R6 | 161.28mW | 14.024mA | 820Ω | 11.5V |
| Total | 249.703mW | 21.713mA | 529.628Ω | 11.5V |

Measurements

1. Construct the circuit on the previous page. Take measurements and complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P | I | R | E |
| R1 |  |  |  |  |
| R2 |  |  |  |  |
| R3 |  |  |  |  |
| R4 |  |  |  |  |
| R5 |  |  |  |  |
| R6 |  |  |  |  |
| Total |  |  |  |  |

Evaluations

1. What would be the effect of increasing the value of R6 on total circuit resistance?
   1. Go Up
   2. Go Down
   3. Stayed the same
2. What would be the effect of increasing ES on branch current ICD?
   1. Go Up
   2. Go Down
   3. Stayed the same
3. If R3 was removed from branch 2, how would total power be affected?
   1. Go Up
   2. Go Down
   3. Stayed the same
4. What would be the effect of removing R6 on PAB and PCD?
   1. Go Up
   2. Go Down
   3. Stayed the same