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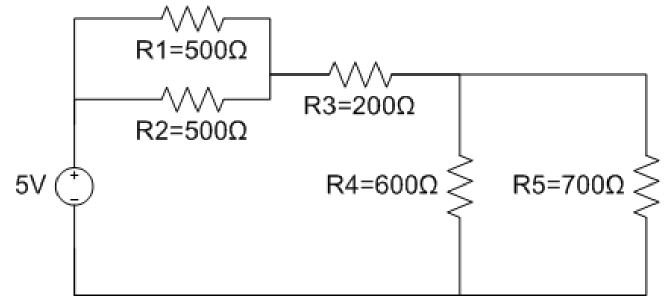
Exercise 04 – Analog Read
PEMBEDS-MI192-3rd 2020-2021

April 27, 2021
5:00 pm – 7:00 pm

1. Given the circuit below. Compute the total resistance, total current and voltage drop across V_{R4R5}, V_{R3}, and V_{R1R2}. Compare it against the voltage measured multimeters and using Arduino (TinkerCAD). Please show solution and screen shot the circuit which includes the multimeter's readings and Arduino readings on both voltage drops and total current. Screen shots for the following



a. V_{R4R5}
b. Σ V_{R4R5}, V_{R3}
c. Σ V_{R4R5}, V_{R3}, V_{R1R2}

Computing for the Total Resistance:
Given: R1 = 500 Ω; R2 = 500 Ω; R3 = 200 Ω; R4 = 600 Ω; R5 = 700 Ω

R4 || R5 = (600 Ω * 700 Ω) / 600 Ω +700 Ω
R4 || R5 = 420000 Ω / 1300 Ω
R4 || R5 = 420000 Ω / 1300 Ω
R4 || R5 = 323.08 Ω

R3 + (R4 || R5) = R3 + 323.08 Ω
R3 + (R4 || R5) = 200 Ω + 323.08 Ω = **523.08 Ω**
R3 + (R4 || R5) = **523.08 Ω**

R1 || R2 = (500 Ω * 500 Ω) / (500 Ω + 500 Ω)
R1 || R2 = 250000 Ω / 1000 Ω
R1 || R2 = 250000 Ω / 1000 Ω
R1 || R2 = 250 Ω

(R1 || R2) + R3 + (R4 || R5) = 250 Ω + 523.08 Ω
R_T = 773.08 Ω (Total Resistance)

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Computing for the Total Current:
Given: V_T = 5V; R_T = 773.08 Ω

V=IR

$I_T = V_T/R_T$
I_T = 5V/773.08 Ω
I_T = 0.00646 A

Computing for Voltage drop of VR1R2:
Given: R1 || R2 = 250 Ω; I = 0.00646 A

V_{R1R2} = I(R1||R2)
V_{R1R2} = (0.00646 A)(250 Ω)
V_{R1R2} = 1.615 V

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Computing for Voltage drop of VR3:
Given: R3 = 200 Ω; I = 0.00646 A

V_{R3} = IR3
V_{R3} = (0.00646 A)(200 Ω)
V_{R3} = 1.292 V

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Computing for Voltage drop of VR4R5:
Given: R3 = 200 Ω; I = 0.00646 A

V_{R4R5} = I(R4||R5)
V_{R4R5} = (0.00646 A)(323.08 Ω)
V_{R4R5} = 2.087 V

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Computing for ΣVR3, VR4R5:
Given: VR3 = 1.292 V; VR4R5 = 2.087 V
ΣV_{R3}, V_{R4R5} = (V_{R3}) + (V_{R4R5})
ΣV_{R3}, V_{R4R5} = 1.292 V + 2.087 V
ΣV_{R3}, V_{R4R5} = 3.379 V
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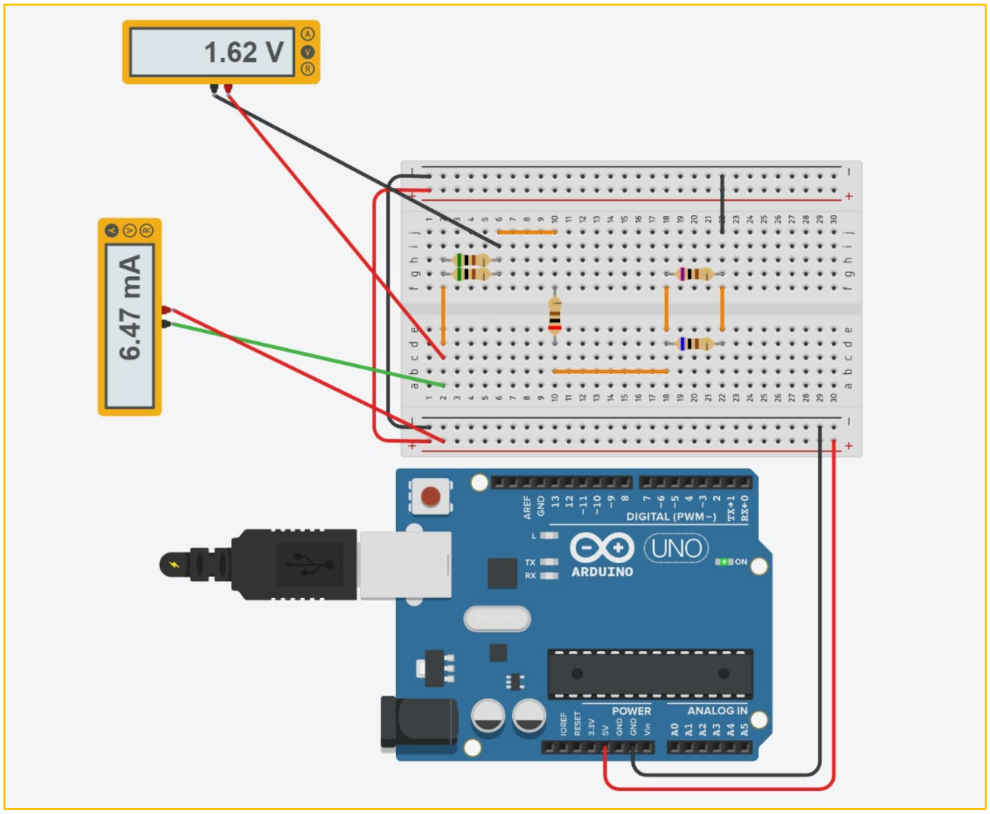
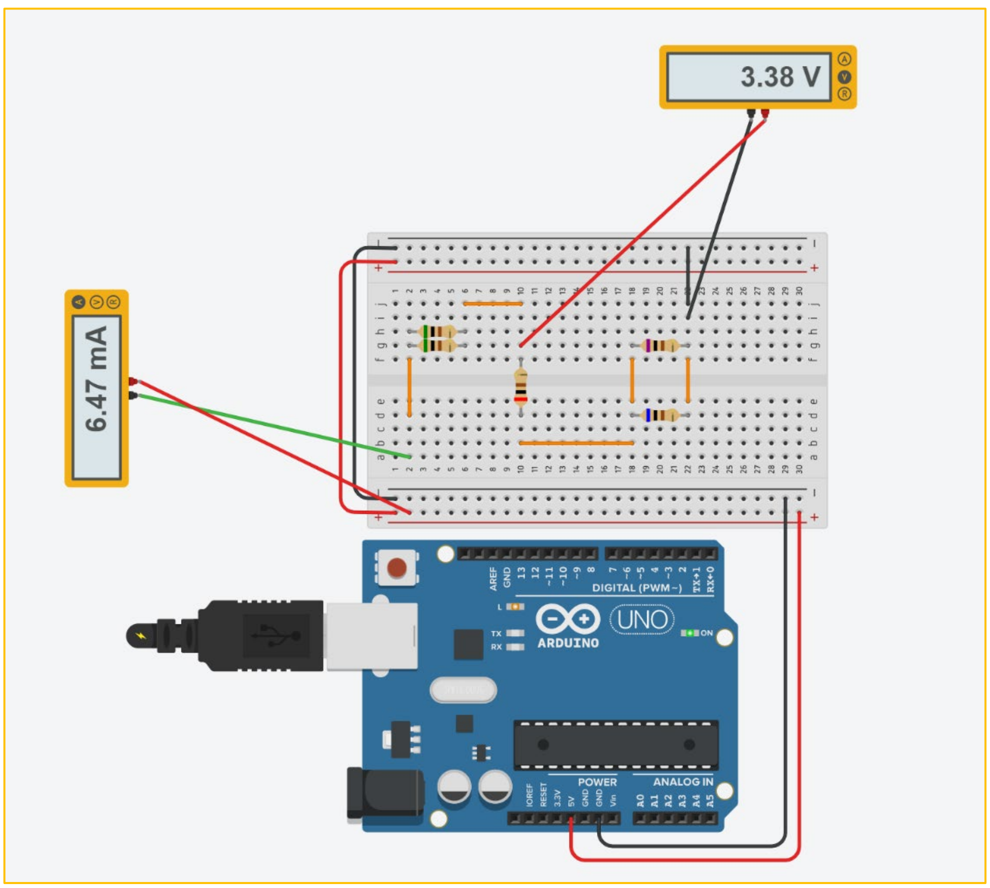
Computing for Total Voltage Drop:
Given: VR1R2 = 1.615 V; VR3 = 1.292 V; VR4R5 = 2.087 V
ΣV_{R3}, $V_{R4R5,}$ V_{R1R2} = (VR1R2) + (VR3) + (VR4R5)
ΣV_{R3}, $V_{R4R5,}$ V_{R1R2} = 1.615 V + 1.292 V + 2.087 V
ΣV_{R3}, $V_{R4R5,}$ V_{R1R2} = 4.995 V (~5V)

Item 1 Screenshot:

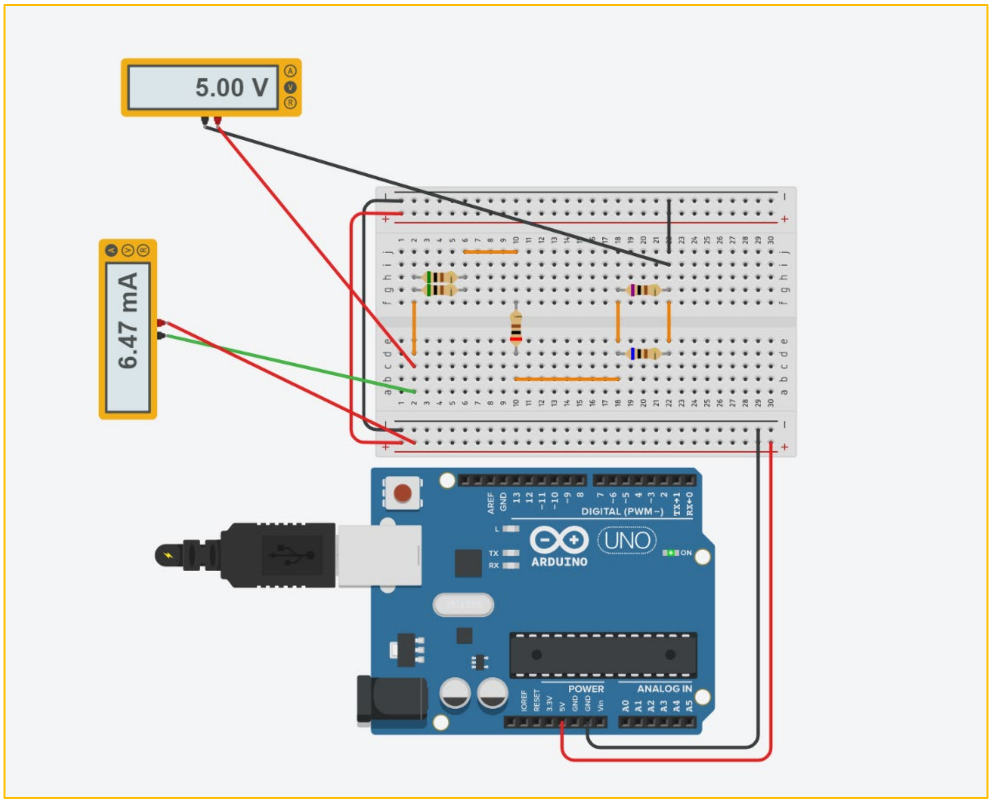
a. V_{R4R5}



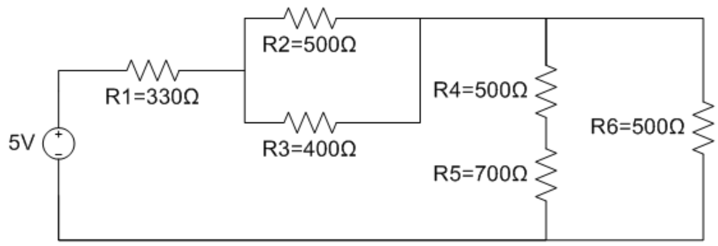
b. Σ V_{R4R5}, V_{R3}



c. Σ V_{R4R5}, V_{R3}, V_{R1R2}



2. Given the circuit below. Compute the total resistance, total current and voltage drop across V_{R4R5R6}, V_{R2R3} and V_{R1}. Compare it against the voltage measured multimeters and using Arduino (TinkerCAD). Please show solution and screen shot the circuit which includes the multimeter's readings and Arduino readings on both voltage drops and total current.



a. V_{R4R5R6}
b. Σ V_{R4R5R6}, V_{R2R3}
c. Σ V_{R4R5R6}, V_{R2R3}, V_{R1}

Computing for Total Resistance:
Given: R1 = 330 Ω; R2 = 500 Ω; R3 = 400 Ω; R4 = 500 Ω; R5 = 700 Ω; R6 = 500 Ω

R2 || R3 = (500 Ω * 400 Ω)/(500 Ω + 400 Ω)
R2 || R3 = 222.22 Ω

R4 + R5 = 500 Ω + 700 Ω
R4 + R5 = 1200 Ω

(R4+R5)||R6 = (1200Ω * 500Ω)/(1200Ω + 500Ω)
(R4+R5)||R6 = 352.94 Ω

R_T = R1 + (R2 || R3) + ((R4 + R5) || R6)
R_T = 330 Ω + 222.22 Ω + 352.94 Ω
R_T = 905.16 Ω

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Computing for Total Current
Given: V_T = 5 V; R_T = 905.16 Ω; I_T = ?

$I_T = V_T/R_T$
I_T = 5 V / 905.16 Ω
I_T = 0.005524 A

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Computing for Voltage drop of V_{R1}:
Given: R1 = 330 Ω; I1 = 0.005524 A

V_{R1} = IR1
V_{R1} = (0.005524 A)(330 Ω)
V_{R1} = 1.8229 V

Computing for Voltage drop of V_{R4R5R6}:
Given: (R4+R5)||R6 = 352.94 Ω; I1 = 0.005524 A

V_{R4R5R6} = I((R4+R5)||R6)
V_{R4R5R6} = (0.005524 A)(352.94 Ω)
V_{R4R5R6} = 1.9496 V

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Computing for Voltage drop of V_{R2R3}:
Given: (R2||R3) = 222.22 Ω; I1 = 0.005524 A

V_{R2R3} = I(R2||R3)
V_{R2R3} = (0.005524 A)(222.22 Ω)
V_{R2R3} = 1.2275 V

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Computing for Voltage drop of Σ V_{R4R5R6}, V_{R2R3}:
Given: V_{R4R5R6} = 1.9496 V; V_{R2R3} = 1.2275 V

Σ V_{R4R5R6}, V_{R2R3} = V_{R4R5R} + V_{R2R3}
Σ V_{R4R5R6}, V_{R2R3} = 1.9496 V + 1.2275 V
Σ V_{R4R5R6}, V_{R2R3} = 3.1771 V

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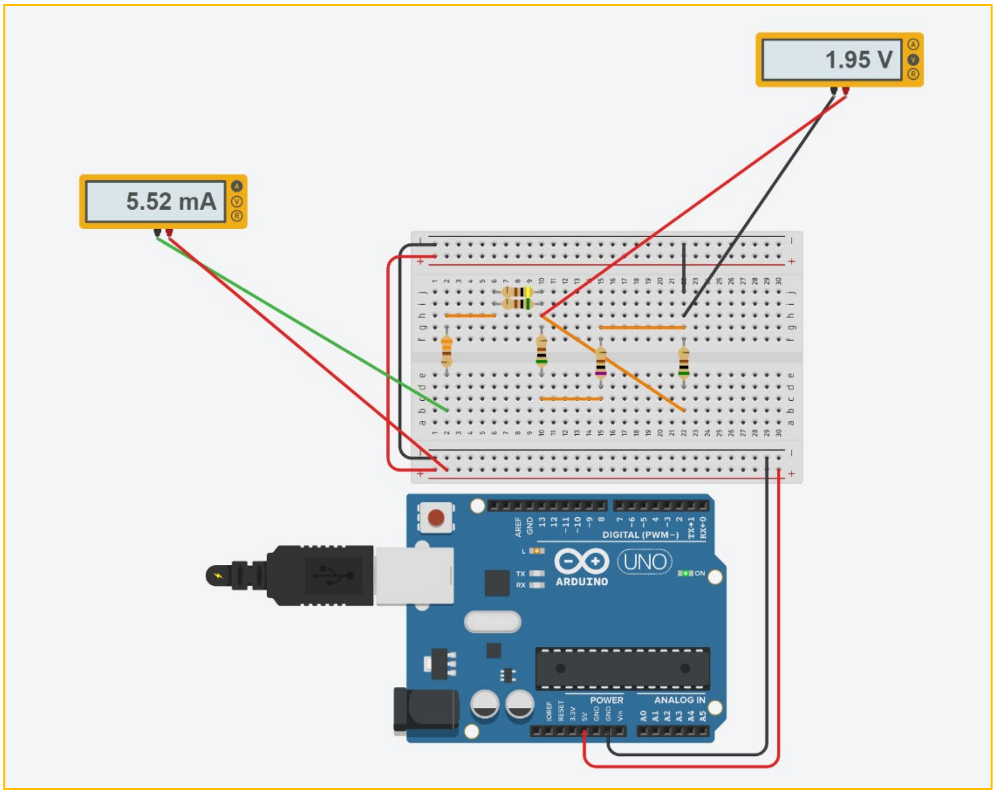
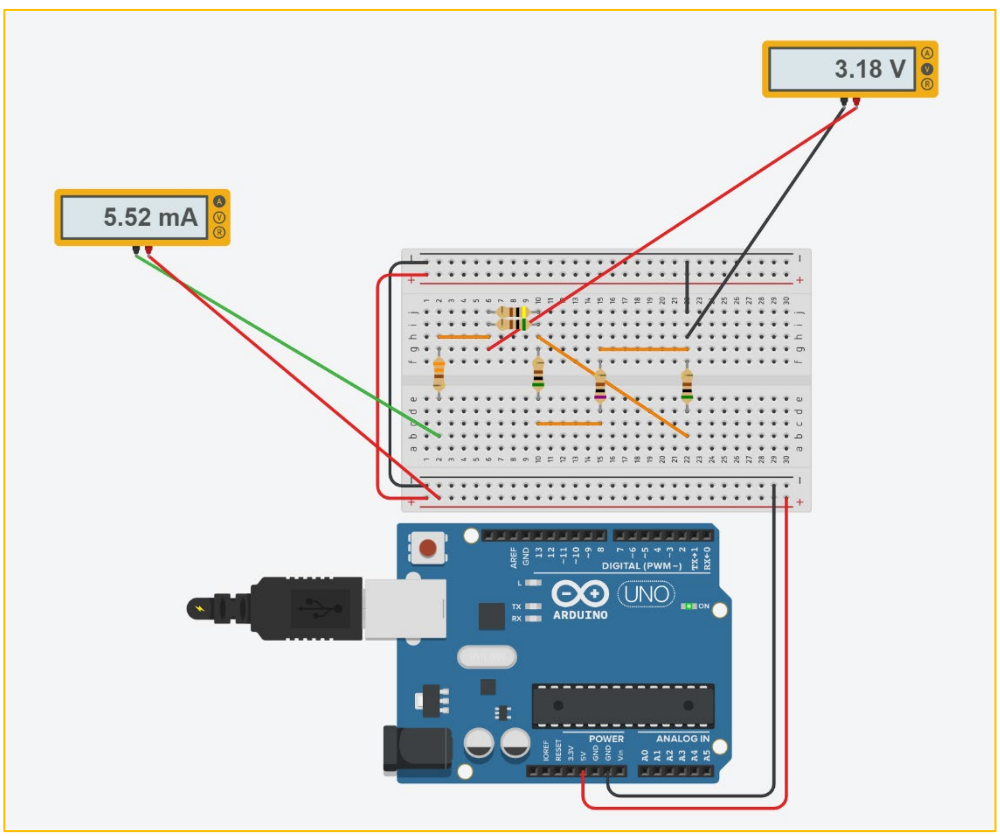
Computing for Voltage drop of Σ V_{R4R5R6}, V_{R2R3}, V_{R1}:
Given: V_{R4R5R6} = 1.9496 V; V_{R2R3} = 1.2275 V; V_{R1} = 1.8229 V

Σ V_{R4R5R6}, V_{R2R3}, V_{R1}= V_{R4R5R} + V_{R2R3} + V_{R1}
Σ V_{R4R5R6}, V_{R2R3}, V_{R1}= 1.9496 V + 1.2275 V + 1.8229 V
Σ V_{R4R5R6}, V_{R2R3}, V_{R1}= 5 V

a. V_{R4R5R6}



b. Σ V_{R4R5R6}, V_{R2R3}



c. $\Sigma\ V_{R4R5R6}$, V_{R2R3}, V_{R1}