

# Circuits 1/2 - FE Electrical Live Training

## Week # 2 – Saturday Session



STUDY FOR FE

Focus areas of this homework assignment include the following topics.

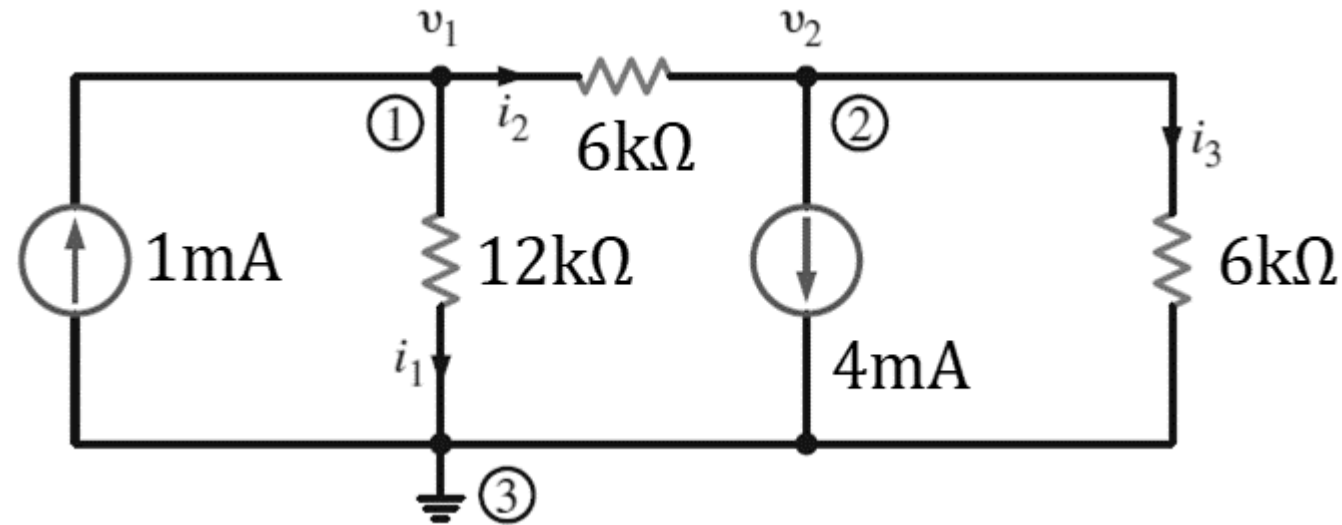
- ☐ Kirchhoff's Current Law
- ☐ Kirchhoff's Voltage Law
- ☐ Superposition
- ☐ Mesh Analysis / Waveform Analysis / Phasors

# Kirchhoff's Laws



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**HW Problem # 1** - Determine the unknown nodal voltages and branch currents of the following circuit.

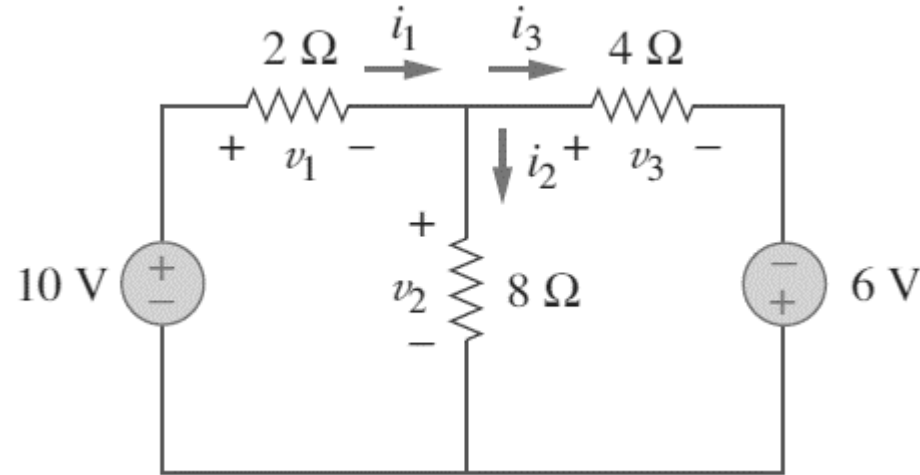


# Kirchhoff's Laws



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**HW Problem # 2** - Determine the unknown nodal voltages and branch currents of the following circuit.

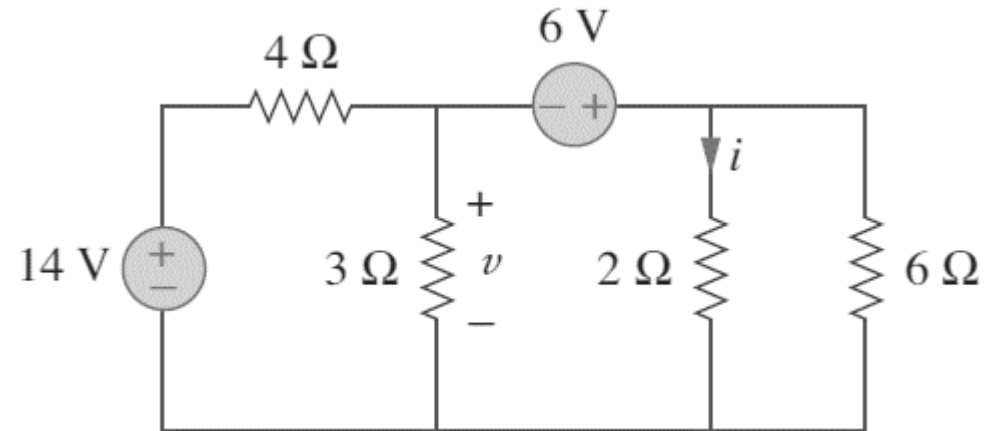


# Kirchhoff's Laws



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**HW Problem # 3** - Calculate the current passing through  $2\Omega$  resistor.



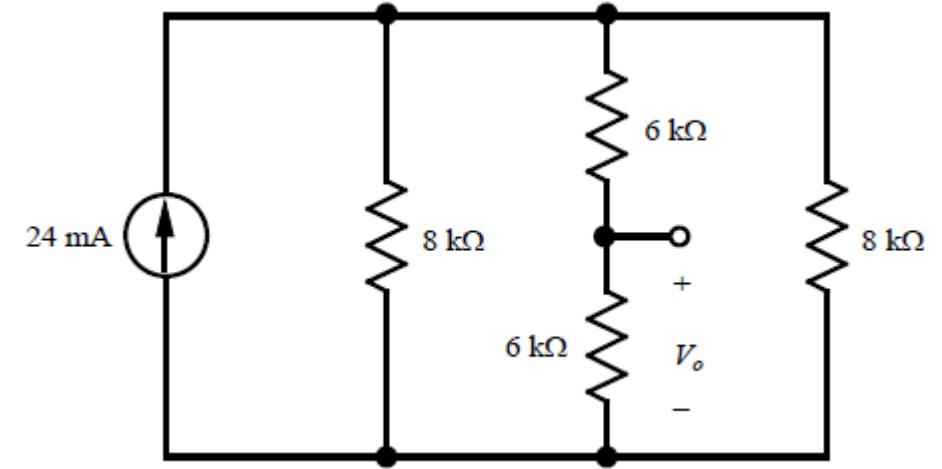
# Kirchhoff's Current Law



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**HW Problem # 4** - Use the 'current divider rule' to calculate the current passing through all branches.

Also calculate the unknown voltage  $V_o$ .

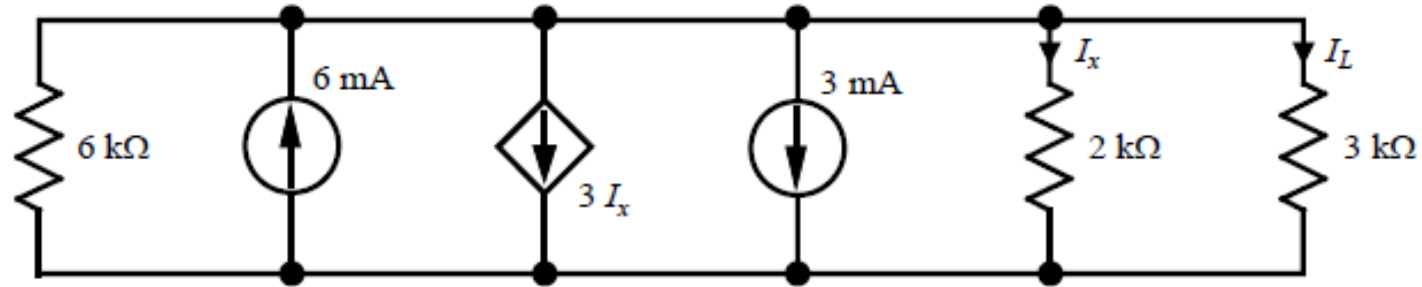


# Kirchhoff's Current Law



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**HW Problem # 5** - Use KCL to calculate the currents  $I_x$  and  $I_L$  in the circuit given below.

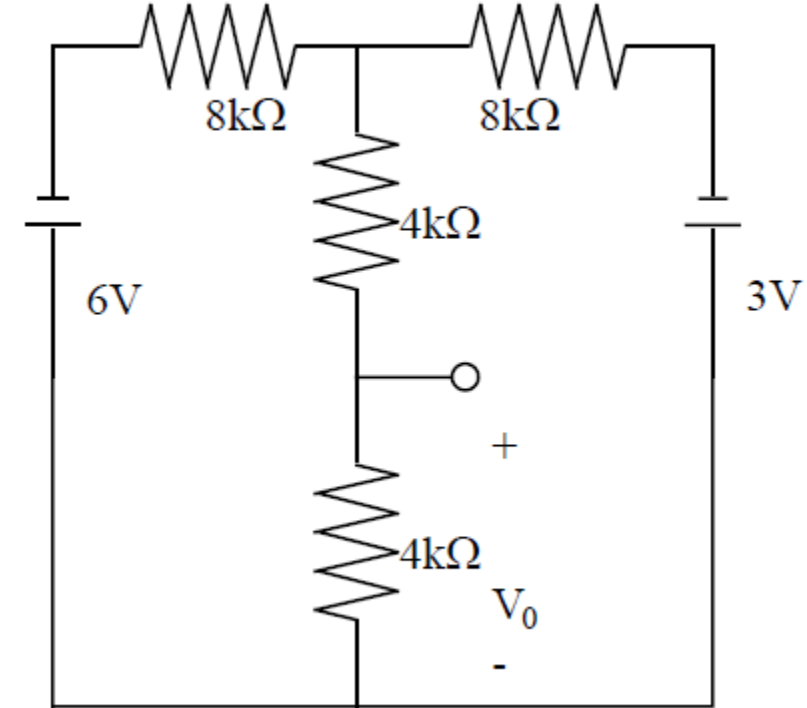


# Kirchhoff's Current Law



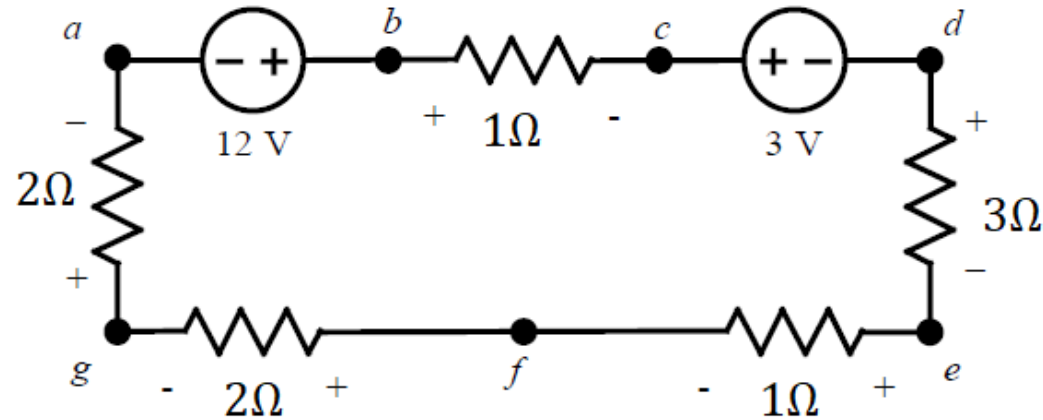
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**HW Problem # 6** - Use KCL to calculate the currents in all branches as well as value of  $V_o$ . below.



# Kirchhoff's Voltage Law

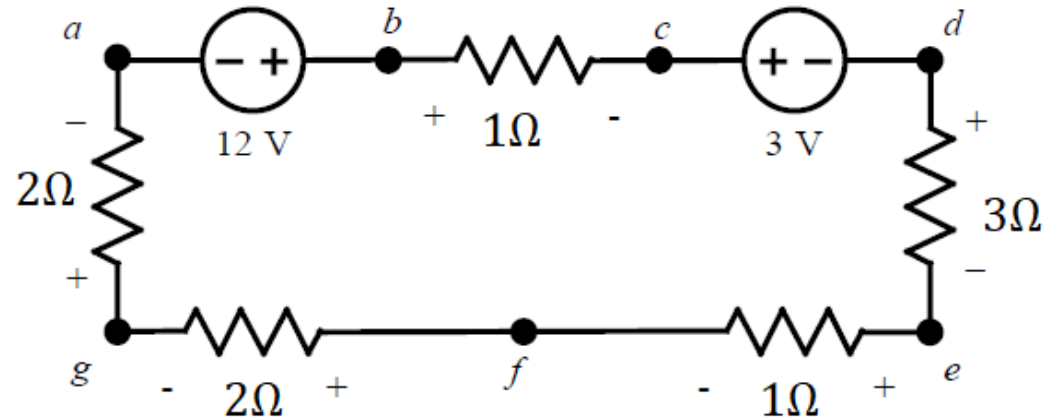
**HW Problem # 7** - Determine the value and direction of current flowing through the circuit given below.





# Kirchhoff's Voltage Law

**HW Problem # 8** - Determine the value of  $V_{dg}$  in the circuit given below.

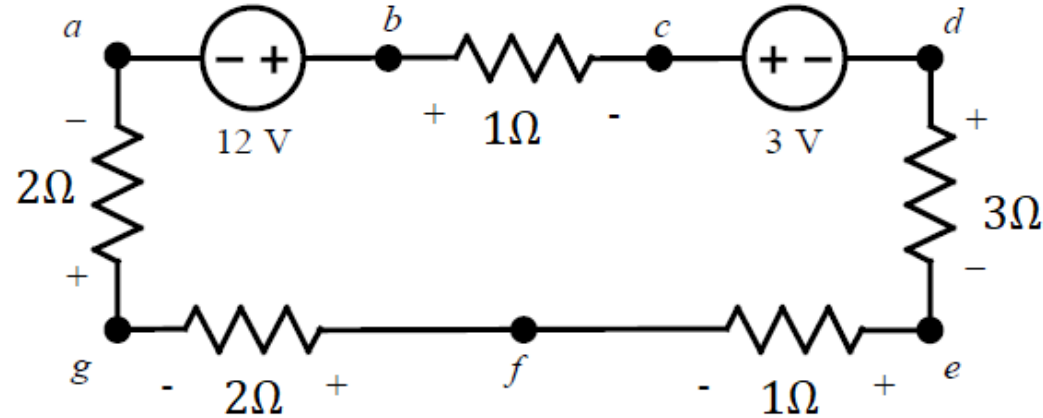


# Kirchhoff's Voltage Law



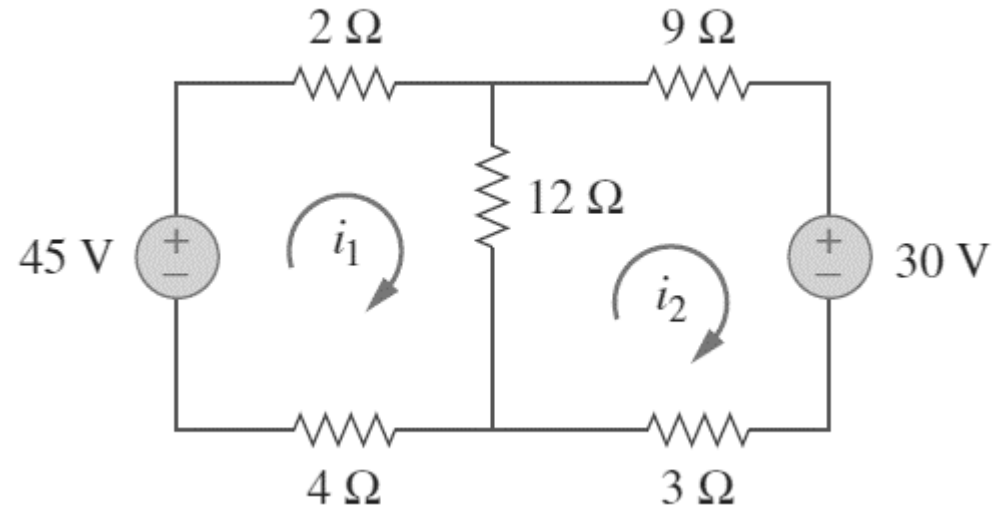
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**HW Problem # 9** - Determine the value of  $V_{gd}$  in the circuit given below.



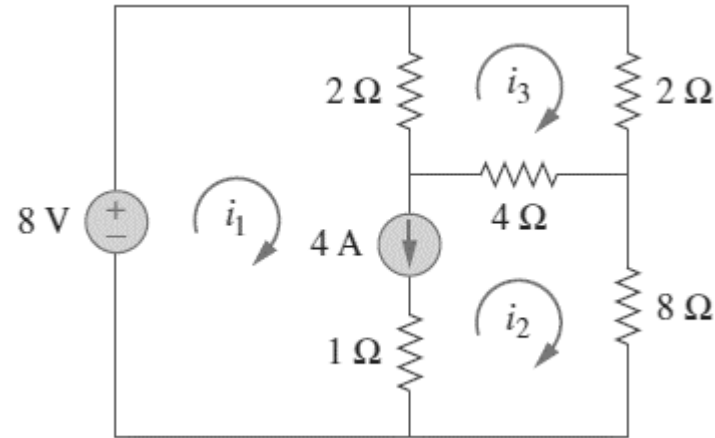
# Mesh Analysis

**HW Problem # 10** - Use the mesh analysis to calculate unknown mesh currents.



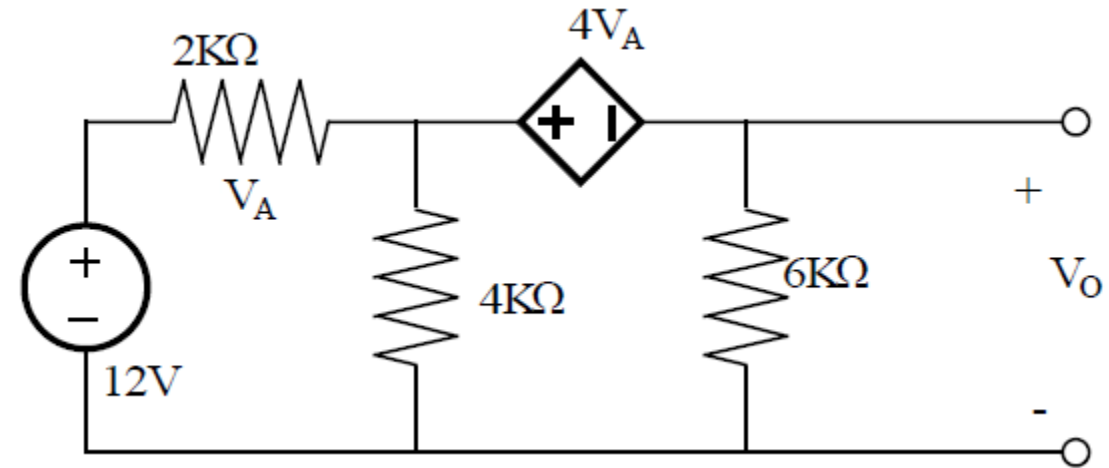
# Mesh Analysis

**HW Problem # 11** - Use the mesh analysis to calculate unknown mesh currents.



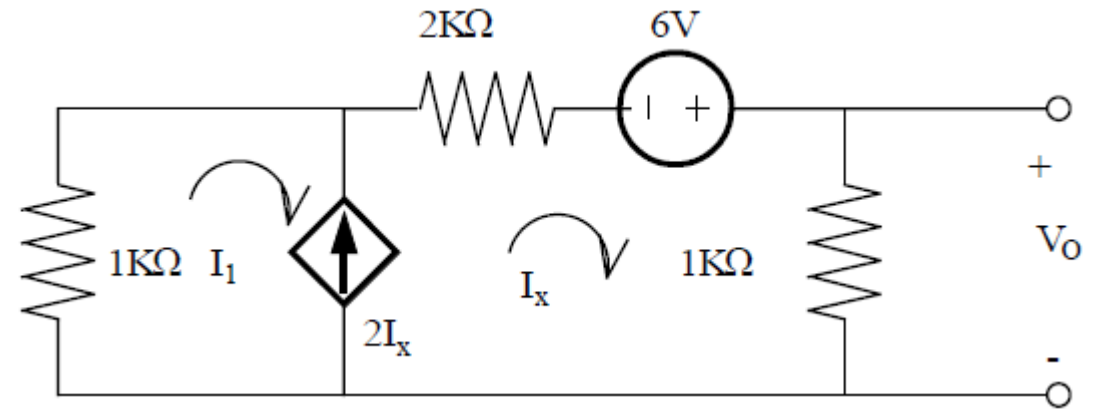
# Mesh Analysis

**HW Problem # 12** - Use the mesh analysis to calculate loop current,  $V_o$  and  $V_A$  for the circuit given below.



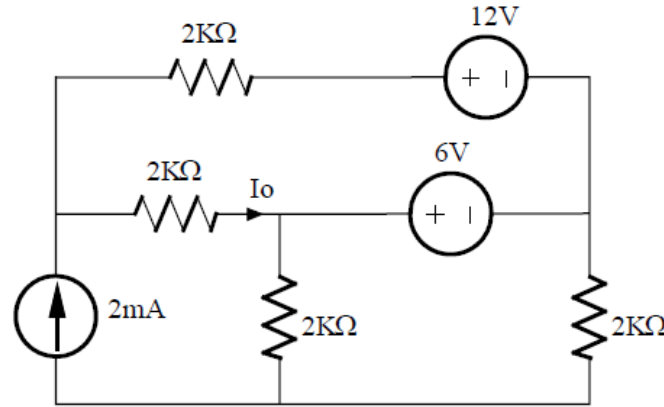
# Mesh Analysis

**HW Problem # 13** - Use the mesh analysis to calculate  $V_o$  and  $I_x$  for the circuit given below.



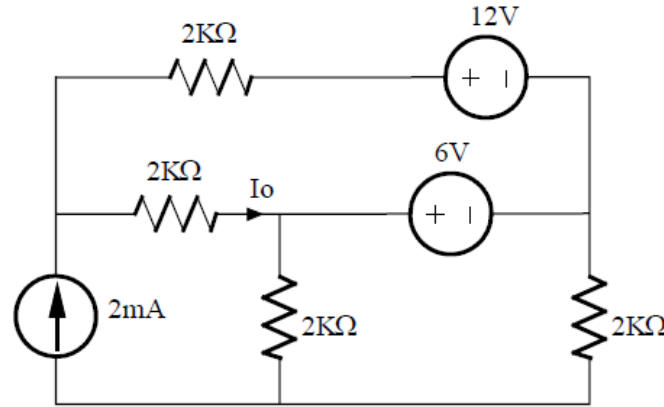
# Superposition

**HW Problem # 14** - Calculate the current contribution for  $I_o$  by each power source.



# Superposition

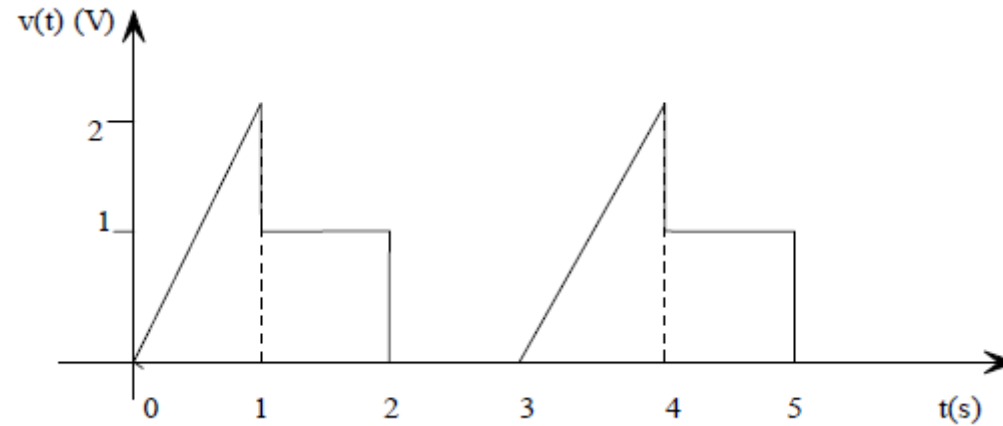
**HW Problem # 15** - Use superposition to determine the total current  $I_o$ .





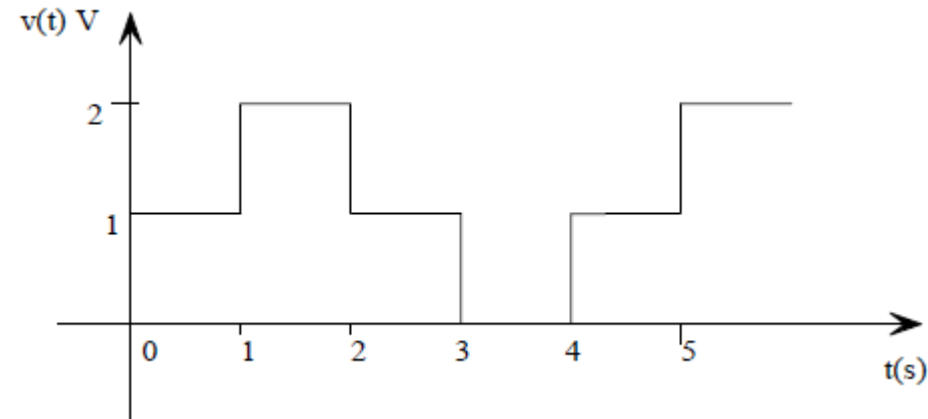
# Waveform Analysis

**HW Problem # 16** - Calculate the RMS value of the voltage waveform shown below.



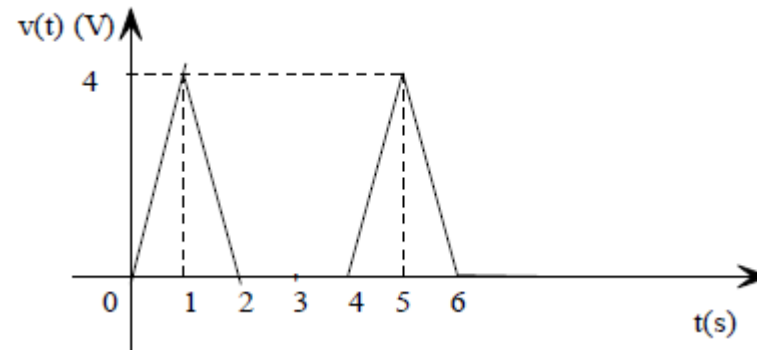
# Waveform Analysis

**HW Problem # 17** - Calculate the average and rms values of the voltage waveform shown below.



# Waveform Analysis

**HW Problem # 18** - Calculate the rms values of the voltage waveform shown below.



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## Circuit Analysis 1/2 – Answer Key



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1)  $v_1 = -6V, v_2 = -15V$

2)  $i_1 = 3A, i_2 = 0.5A, i_3 = 2.5A$

3)  $i = 2.8A$

4)  $V_o = 36V$

5)  $I_x = 0.6mA$

6)  $0.375mA, -0.375mA, 0A, -1.5V$

7)  $1A, clockwise$

8)  $6V$

9)  $-6V$

10)  $2.5A, 0A$

11)  $4.632A, 0.631A, 1.473A$

12)  $3.16V, -3.79V$

13)  $3V$

14)  $3mA, 1mA, -1.5mA$

15)  $2.5mA$

16)  $0.88V$

17)  $1V, 1.22V$

18)  $1.63V$