Section 1: Basics.

Wednesday, January 10, 2024 4:06 PM

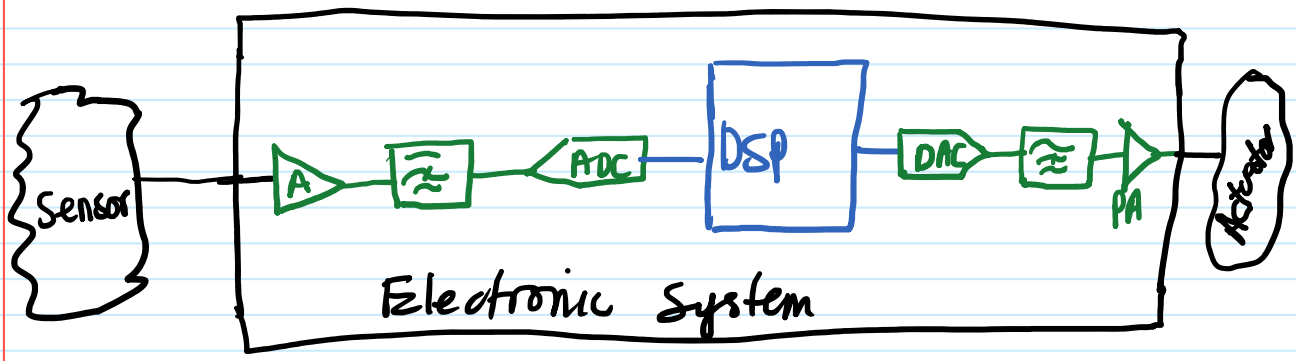
Last day to submit HW0 for grade : 2/16/2024 @ 4:10 pm

Electronic System.

→ Interface with real world (sense)

→ Process sensor data to extract information

→ Send information back into real world

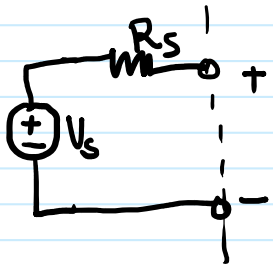


antenna
Microphone
Keyboard
Camera
Joystick
touch screen
satelite
thermometer

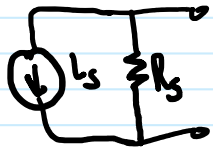
antenna
Speaker
display
sump pump
haptics
motor
TNT charge

thermometer

Sensor Model

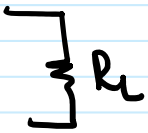


Thevenin Source

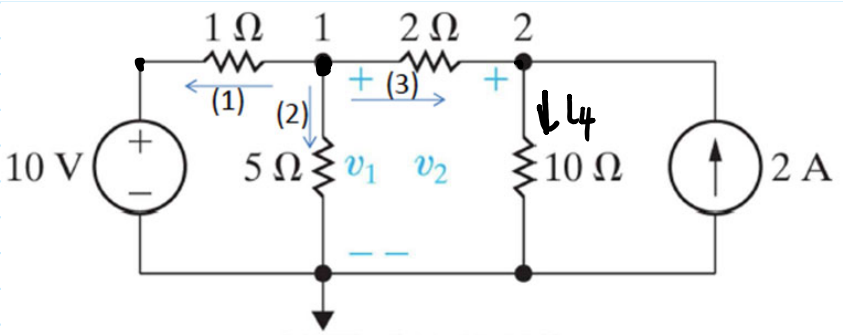


Norton Source

Actuator Model



Exercise #1



KCL @ node 1

$$-I_1 - I_2 - I_3 = 0$$

$$-\frac{(V_1-10)}{1} - \frac{(V_1-0)}{5} - \frac{(V_1-V_2)}{2} = 0$$

$$10 - V_1 - \frac{V_1}{5} - \frac{V_1}{2} + \frac{V_2}{2} = 0$$

$$100 - 10V_1 - 2V_1 - 5V_1 + 5V_2 = 0$$

$$100 - 17V_1 + 5V_2 = 0 \quad -②$$

KCL @ node 2

$$I_3 - I_4 + 2 = 0$$

$$\frac{V_1-V_2}{2} - \frac{(V_2-0)}{10} + 2 = 0$$

$$5(V_1-V_2) - V_2 + 20 = 0$$

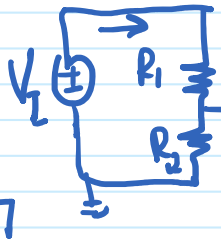
$$5V_1 - 6V_2 + 20 = 0 \quad -①$$

$$V_1 = 9.09\,V,\ V_2 = 10.91\,V$$

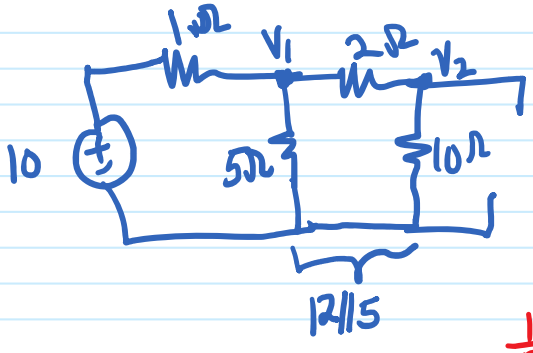
Superposition

Superposition

Current is zero



$$V_O = \frac{R_2}{R_1+R_2} V_I$$



$$V_1 = \frac{12//5}{12//5+1} \times 10 = \frac{3.53}{4.53} = 7.79$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} \rightarrow R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

$$V_2 = \frac{10}{12} \times 7.79 = 6.49\,V.$$