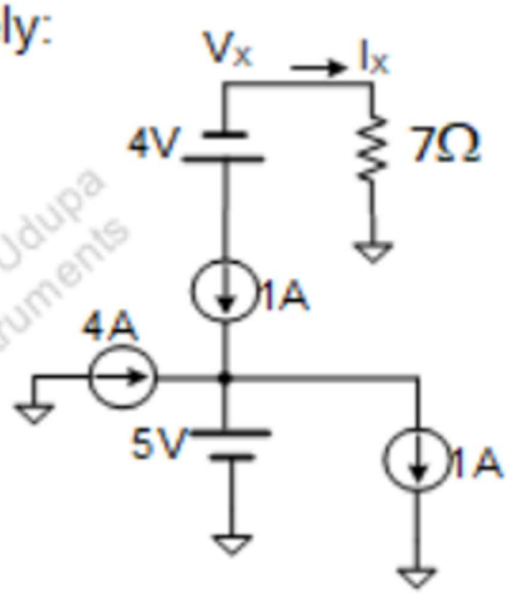
TI BYTE Simulation Exercise

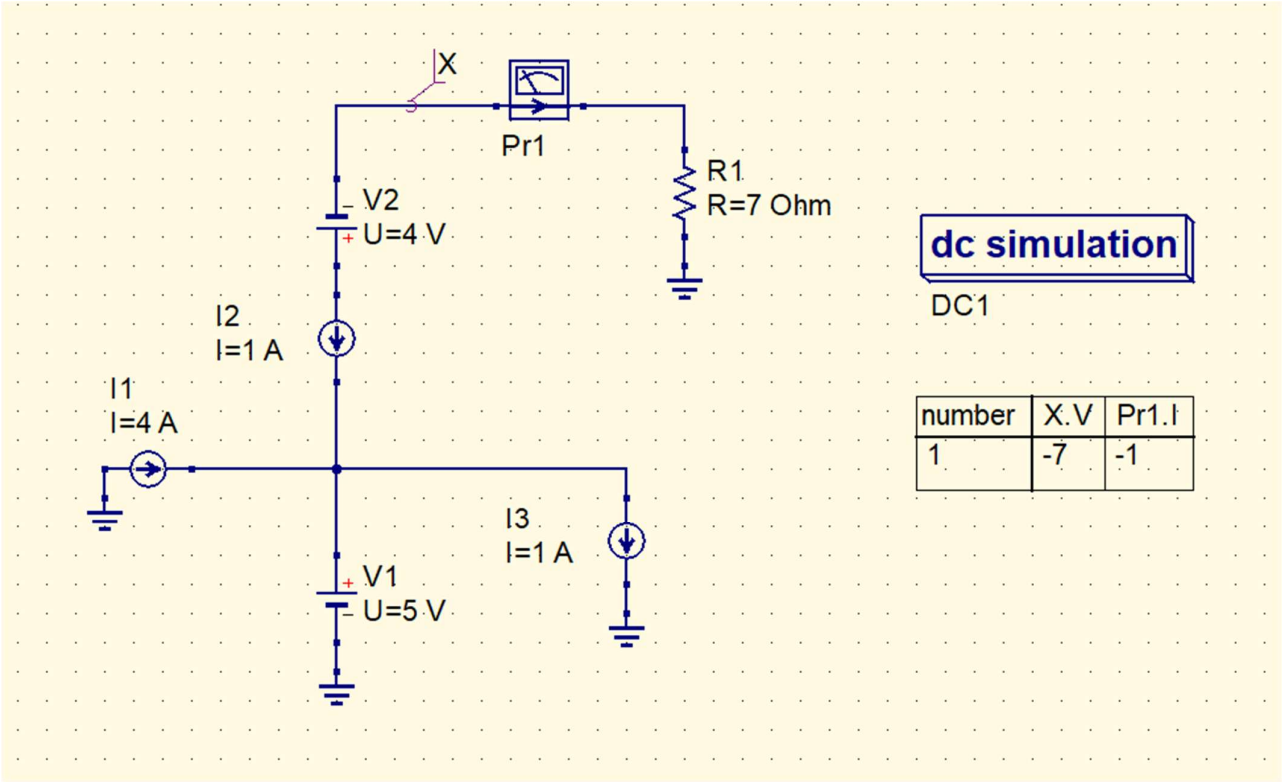
Week 0 : Voltage and Current Sources

- **Question 1:**

103. V_X and I_X are respectively:
(a) 4V, 1A
(b) -4V, -1A
(c) 4V, -1A
(d) -7V, -1A
(e) 7V, 4A
(f) 1V, 4A
(g) -1V, -4A
(h) Not a valid circuit



- **QUCS Circuit:**



- **X is used to label the node and find the voltage at that node.**
- **Current probe (Pr1) is used to check the current through that wire.**

➢ QUCS Result:

Therefore, from the simulation, we get our answer as:

V_x = -7V

I (Pr1) = -1A

Answer: (d)

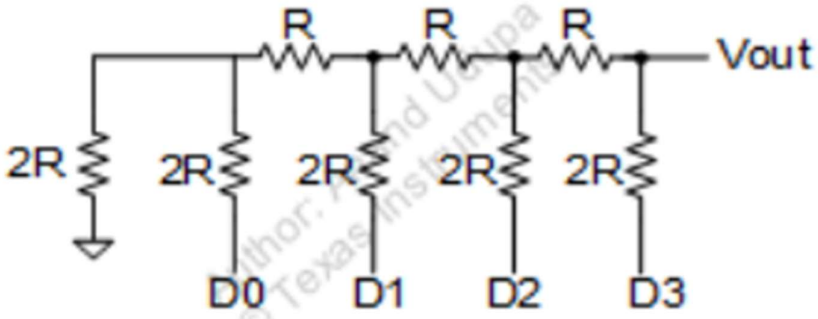
➢ Conclusion:

- **In a series circuit, the current that flowing through each component is the same.**
- **A voltage source and a current source in series is equivalent to a current source in series.**

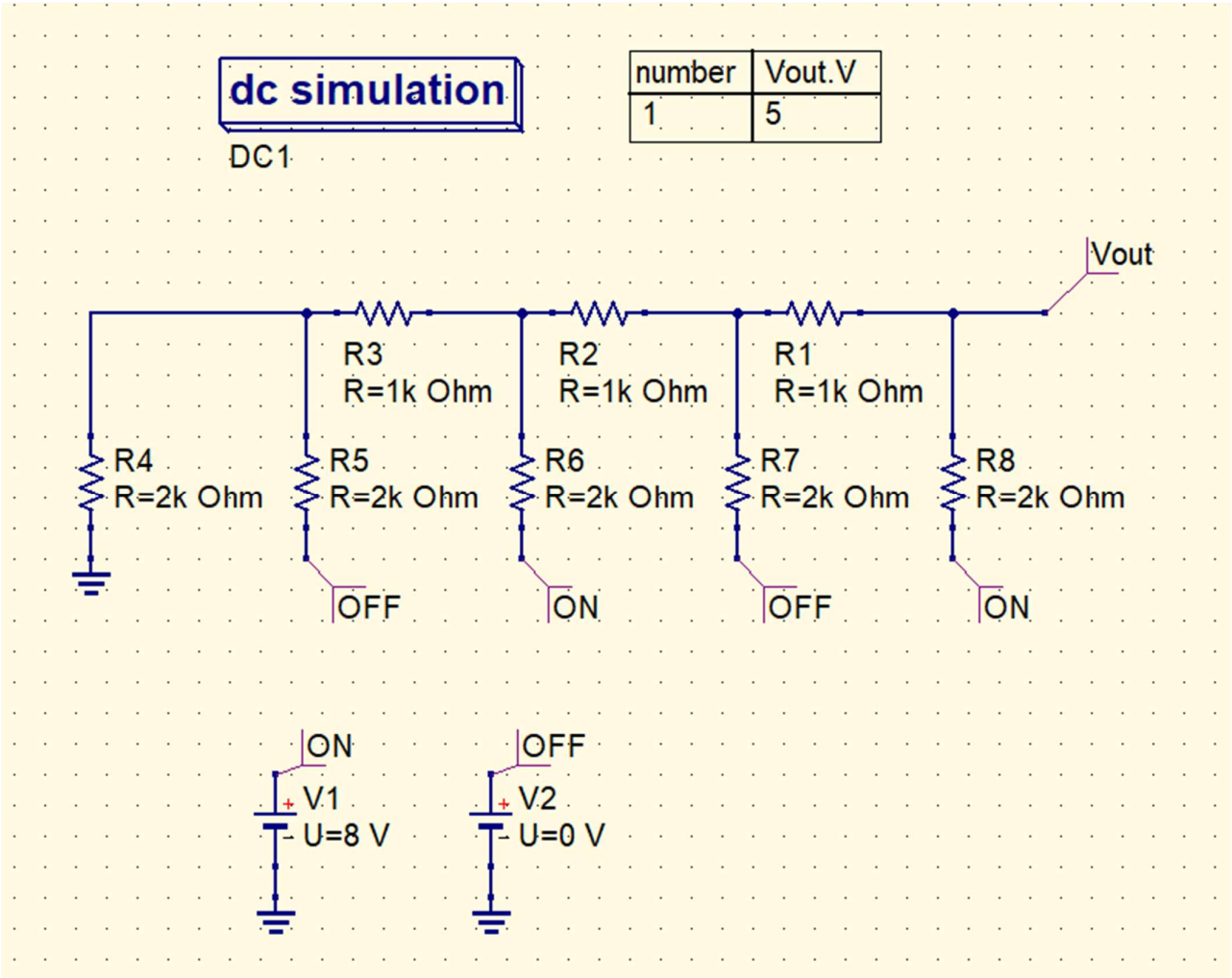
- **Question 2:**

309. For the DAC circuit shown, what is Vout for the digital input D3=1, D2=0, D1=1, D0=0, if Vref=8V, \where Vref is the reference voltage for the DAC.

(a) 6V
(b) 2V
(c) 8V
(d) 4V
(e) 7V
(f) 3V
(g) 1V
(h) 5V



➢ **QUCS Circuit:**



- **The node V_{out} is used to find out the resulting voltage at that node.**
- **The nodes ON is used to signify a Digital value of 1 (Analog equivalent voltage of 8 V (V_{ref})).**
- **The nodes OFF is used to signify a Digital value of 0 (Analog equivalent voltage of 0 V (Ground)).**

➢ QUCS Result:

Therefore, from the simulation, we get our answer as:

V_{out} = 5V

Answer: (h)

➢ Conclusion:

- **A Resistance-ladder can be minimized into a simple circuit using the Thevenin theorem or the Norton theorem.**
- **The superposition theorem can also be applied to simplify the complex ladder.**
- **A voltage source (V) and a resistor (R) in series can be converted into its Norton equivalent, a current source (I) and a resistance (R') in parallel, by:**

$$I = \frac{V}{R} ;$$

$$\text{and, } \quad R' = R$$