Assignment 1

BRAC University

Semester: Fall 2022
Course No: CSE251
Course Title: Electronic Devices and Circuits

Full Marks: 100
Deadline: 18 October 2022

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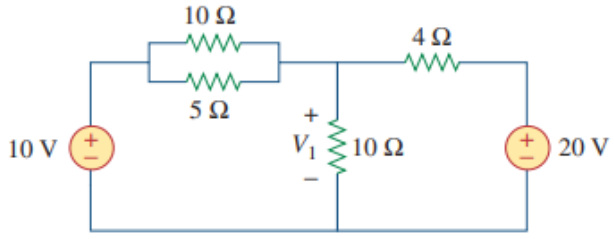
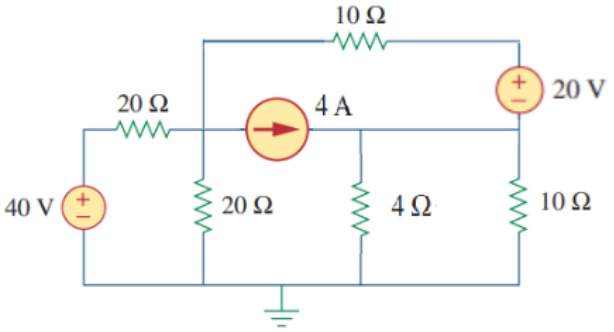
1. Draw the alternate representations of the following circuits *[Note that the number of floating sources should be minimized in your design]*. **[10+10]**

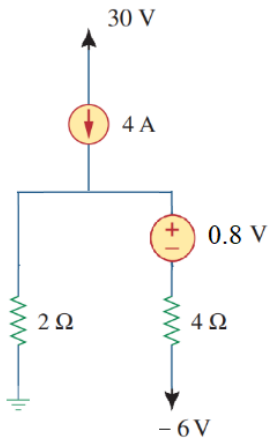
a)



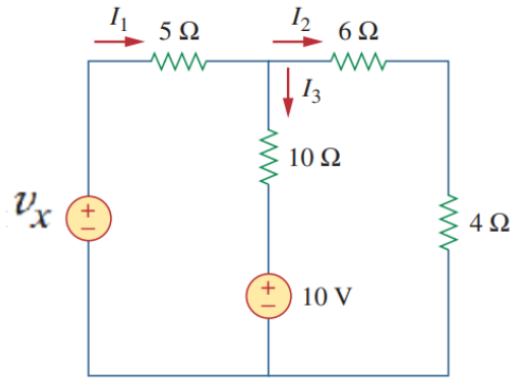
b)



2. Find the loop representation of the following circuit: **[10]**



3.



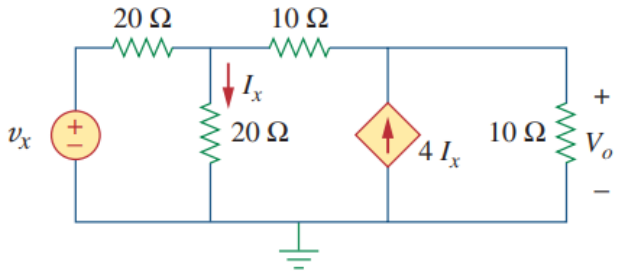
Here, v_x = (10+last digit of your ID) V

(i) Draw the alternate circuit representation of the circuit shown in the Figure above *[Note that the number of floating sources should be minimized in your design]*.

(ii) Apply KCL and KVL on the circuit drawn in 3(i) and calculate I_1, I_2, and I_3.

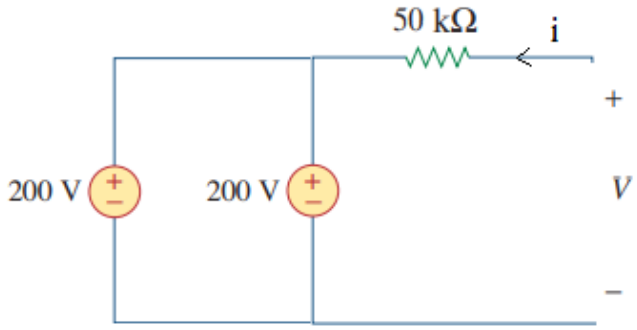
[10+20]

4. Use nodal analysis to find V_o in the following circuit: **[20]**



Here, v_x = (40+last digit of your ID) V

5.



(i) Draw the i-V graph of the circuit drawn above**.** Clearly mention the coordinates of x and y-intersecting points on the graph *[Free-hand drawing is sufficient]***.**

(ii) What happens when the resistance becomes **(a) 100kΩ, (b) 200kΩ instead of 50 kΩ? Plot** these cases on the graph and explain the result**.**

[10+10]

6.

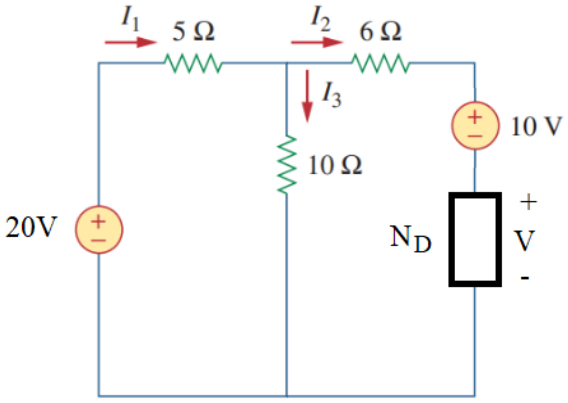


Figure 1(a)

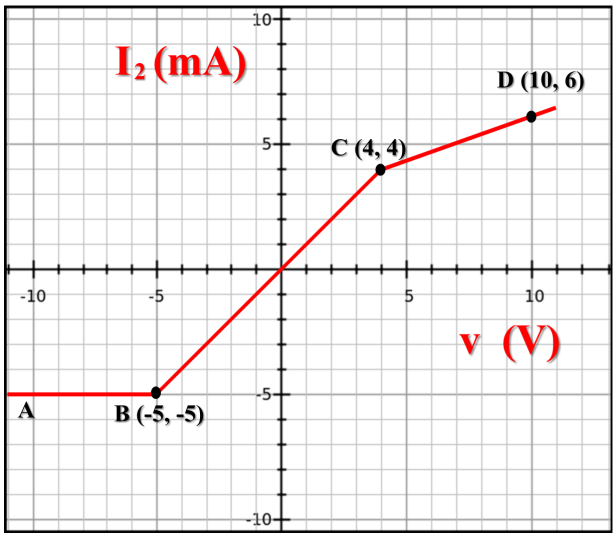


Figure 1(b)

The I-V graph shown in Figure 1(b) is that of a piecewise linear device N_D shown in Figure 1(a). The I-V graph has 3 segments, denoted as AB (Region 1), BC (Region 2), and CD (Region 3).

(a) **Identify** the equivalent linear circuit models for the 3 linear regions shown in the I-V characteristics of the non-linear device N_D and calculate the model parameters.

(b) **Detect** the operating region for the device N_D and **calculate** the value of I_2 when v=2V.

(c) **Show** the alternative representation of the circuit shown in Figure 1 (a).

(d) Consider the device N_D has been replaced by a linear component that shows an I-V characteristic like the BC portion of Figure 1(a). **Apply** KVL and KCL to **calculate** the values of I_1, I_2, and I_3.