

EE 2005 Basic Electronic Circuit
2021-2022 Semester A
Assignment 1

Instructions:

1. Please submit a **softcopy** of your assignment through **CANVAS**.
2. The softcopy should be submitted before **30 Sept 2021 11:55 pm** (Thursday), the **official deadline** for this assignment. **50%** per day will be imposed for a late submission.
3. You are **not required** to type your work in a **word document**. Instead, you can **scan your hand-written copy** in pdf format for softcopy submission.
4. **Plagiarism** is serious misconduct according to the University Code of Conduct. The most severe penalty may lead to a **termination of the study**. Please note that the one who copies or allows others to copy may face the same punishment.

Attempt all the questions (total 100 marks)

1. Refer to the circuit shown in Figure 1,
 - a) How many nodes and branches are in the circuit?
 - b) If the current through R is found to be $4A$, determine the currents I_1 and I_2 by using KCL
 - c) Assume that all the given currents remain unchanged when the resistor R is removed. Determine the current I_1 and I_2 again by using KCL.

(20 marks)

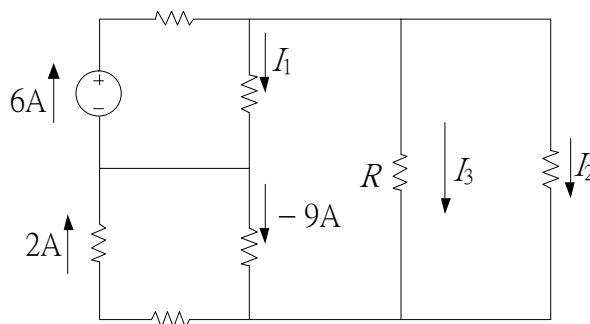


Figure 1

2. In Figure 2, determine the equivalent resistances R_{ab} and R_{cd} being seen at terminal $a-b$ and terminal $c-d$, respectively, if
 - (a) $R_1 = 15\Omega$ and R_2 is removed
 - (b) $R_1 = 0\Omega$ and $R_2 = 5\Omega$

(15 marks)

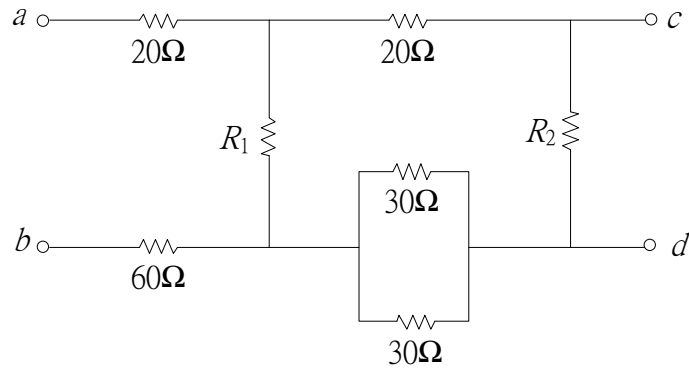


Figure 2

3. In Figure 3, please find the current I and V using the superposition theorem. (15 marks)

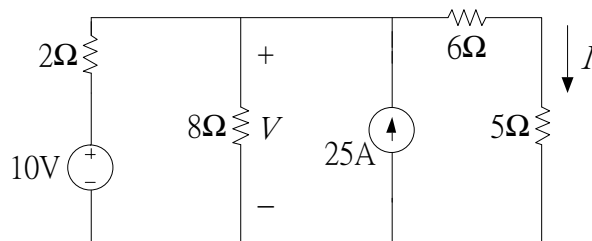


Figure 3

Bonus question: Please comment on whether superposition should be the method of choice compared with mesh and nodal analysis. (2 marks)

4. (a) Write down the mesh equations for the circuit in Figure 4. Hence, calculate the current flowing out from the positive terminal of the 20V source.
- (b) If the 0.5A current source is now replaced by a voltage source such that $V_{ab} = 10V$, apply nodal voltage analysis to calculate the current through the 5Ω resistor.

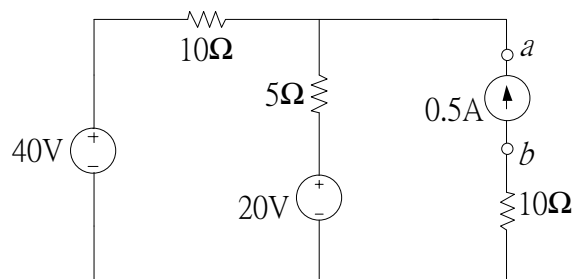


Figure 4

(15 marks)

5. For the circuit shown in Figure 5:

- Find both the Norton and Thevenin equivalent seen across terminals a and b
- Hence write down the value of the load R_L when connected across a-b for achieving maximum power transfer to R_L .

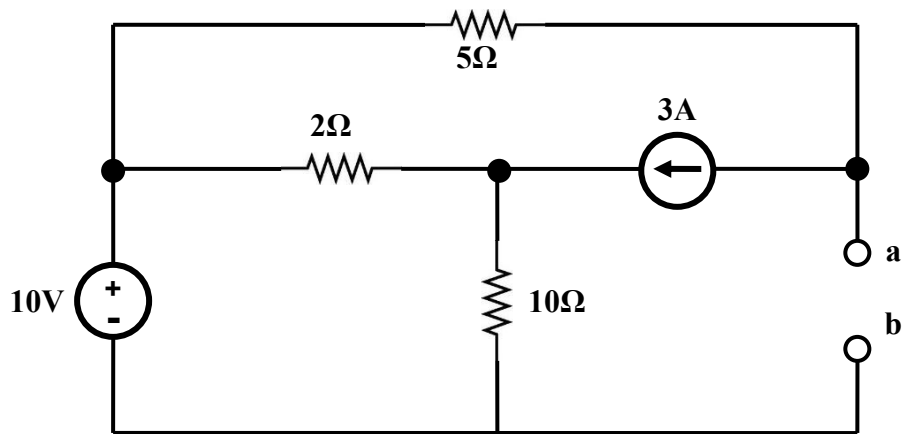


Figure 5

(20 marks)

6. For the Wheatstone bridge in Figure 6:

- Find the Thevenin equivalent circuit seen across a and b
- If $R_1 = R_4 = R_0 - \Delta R$, $R_2 = R_3 = R_0 + \Delta R$, and $|R_0|^2 \gg |\Delta R|^2$, show that $R_{th} = R_0$ and $V_{th} = (\Delta R/R_0)V_S$.

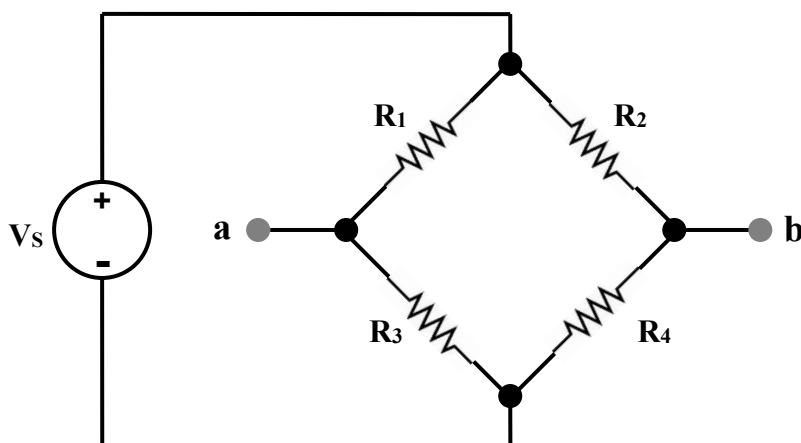


Figure 6

(15 marks)