

## Problem Set #1, EE part

Issue date: Sept. 16, 2022; Deadline: 23:59, Sept. 26, 2022

Student Name: \_\_\_\_\_ Student No.: \_\_\_\_\_

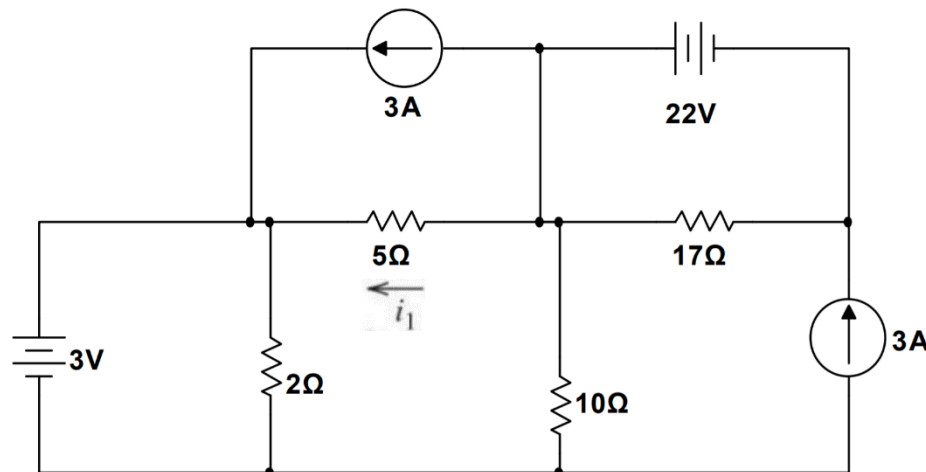
### 1. Electrical and electronic technology

As introduced during the first lecture, many milestone technologies enable electrification (电气化) and informatization (信息化) during the second and third industrial revolutions. In this problem, you are asked to search the Internet (google, bing, baidu, etc.), and find out the specific details of these two concepts.

- Can you specify the different features of electrification and informatization? (10')
- Besides the winners of the five Nobel Prize winner, tell us another one pioneering scientist or engineer who has made significant contributions towards electrification or informatization. (5')
- Point out one of his/her most representative discoveries or inventions. Briefly explain the working principle of such discovery or invention and its relation to electrical engineering (10')

### 2. Linear resistive network

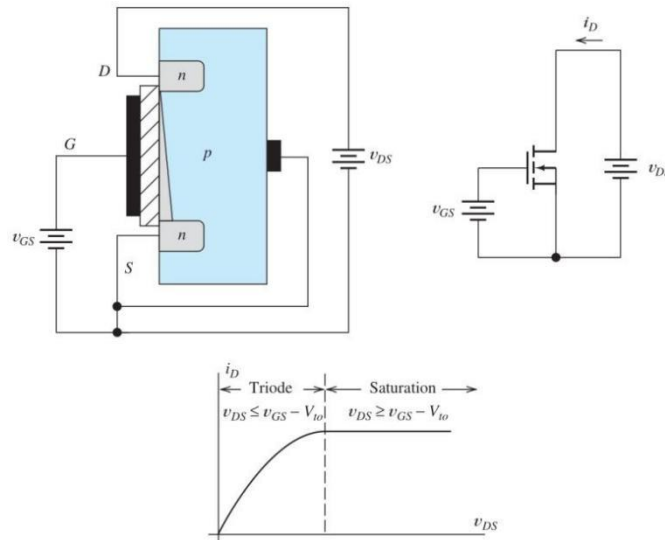
- I-V characteristics is the relationship between voltage and current of a circuit element. Use Multisim simulation to study the I-V characteristics of a current source and a voltage source (hint: connect a resistor and change its value, mark down the current and voltage history, draw the I-V characteristic with excel or by hand). (5')
- Determine the value of  $i_1$  in the following circuit using Multisim simulation tool (show the circuit schematic and simulation results). (15')
- Determine the value of  $i_1$  in the following circuit using Superposition principle 叠加原理. Search the Internet for more information about superposition in circuit analysis. (5')



### 3. Transistor characteristics.

- Select an NMOS model in Multisim. If you don't know which one to use, you can use 2N7000. Build a simple single-MOSFET circuit, as shown below. Generate the characteristic curves under different  $v_{GS}$  (as Figure 12.6 did in the EE textbook). (20')

- Describe how to turn on the NMOS, and how to turn off the NMOS. (5')



\* When capturing circuit schematics and simulation results, taking a screenshot is mandatory. Please refrain from using your phones to take a photo of the screen. If you do so, 20% of the full grades will be deducted from that problem.

\* Please submit the softcopy of your solutions to the problems on gradescope. When uploading to gradescope, please select all corresponding pages related to each question.

\* Please use English.

\* Discussion on methodology is allowed, yet, the assignment should be done individually. Plagiarism, once found, grades zero for the whole homework assignment.