Student Name: _____

Student Number: _____

School: _____

Year of Entrance: _____

ShanghaiTech University Final Examination Cover Sheet
EE111 Fall 2023/2024 Exam 2024/1/18 From 8:00am-10:00am

7 Problems in total (3 A4 crib sheets allowed)

Answer the Questions in English

Two-decimal policy applies for the final answer

Academic Year:	2023 to 2024	Term:	Fall
Course-offering School:	SIST		
Instructor:	Dr. Xinbo ZOU		
Course Name:	Electrical Circuits		
Course Number:	EE111.01		

Exam Instructions for Students:

1. All examination rules must be strictly obeyed throughout the entire test, and any form of cheating is prohibited.

2. Other than allowable materials, students taking closed-book tests must place their books, notes, tablets and any other electronic devices in places designated by the examiners.

3. Students taking open-book tests may use allowable materials authorized by the examiners. They must complete the exam independently without discussion with each other or exchange of materials.
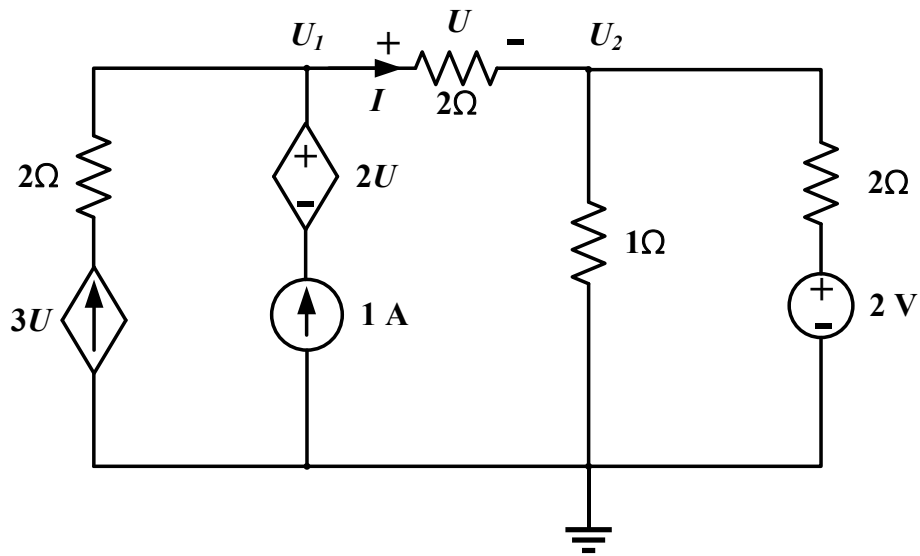
For Marker's Use:

Problem	1	2	3	4	5	6	7	Total
Marks								
Recheck								

Marker's Signature: **Rechecker's Signature:**

**Date:**   **Date:**

Q1 (13 points).

For the following circuit, U denotes the voltage across the resistor at the top of circuit graph. U_1 and U_2 denote the node voltage. Please use **nodal** method to derive current I.
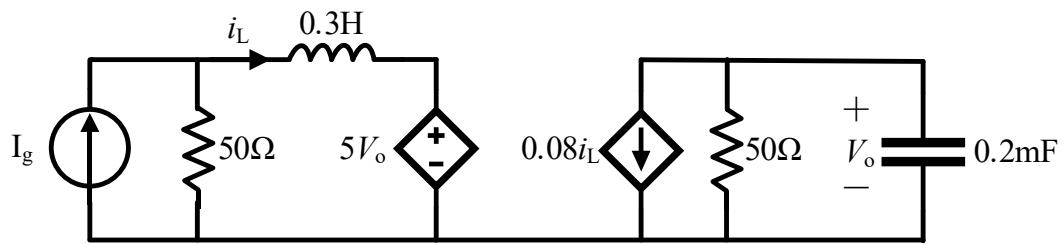
Q2(12 points). **(First-Order Circuit)**

There is no energy stored in the capacitor for $t < 0$. At $t=0$, the switch moves to node a. Then, at $t = 0.1$ s, the switch moves to node b. Find the expression of v_o for $t > 0$.
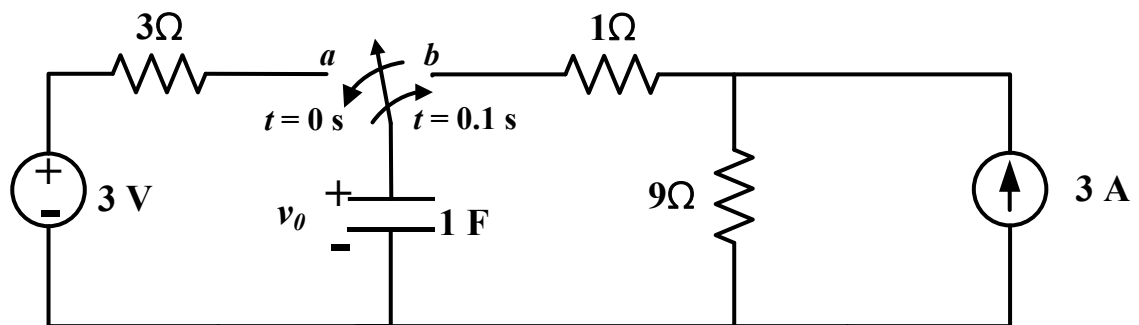
Q3 (15 points). **(AC circuit steady-state analysis)**
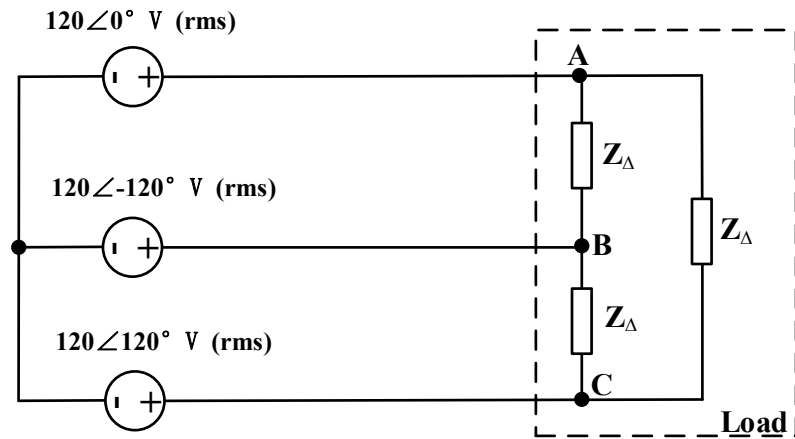Given $I_g = 10\cos(100t - 90°)$, use **phasor domain method** to find steady-state response of V_o.

Q4 (12 points).

For the three-phase circuit below, $\mathbf{Z}_\Delta = 21+j24\,\Omega$, please

(a) find the total complex power absorbed by the **load** (the part in the dashed box).

(b) find average power absorbed by **each of** the delta-connected impedance $\mathbf{Z}_\Delta$.

120∠0° V (rms)

120∠-120° V (rms)

120∠120° V (rms)

A

$\mathbf{Z}_\Delta$

B

$\mathbf{Z}_\Delta$

$\mathbf{Z}_\Delta$

C

Load

Q5 (15 points).

In the circuit below, use **mesh current method** to find

(a) Mesh current.

(b) Complex power released by the voltage source.

(c) The average power delivered to the 18Ω-resistor.
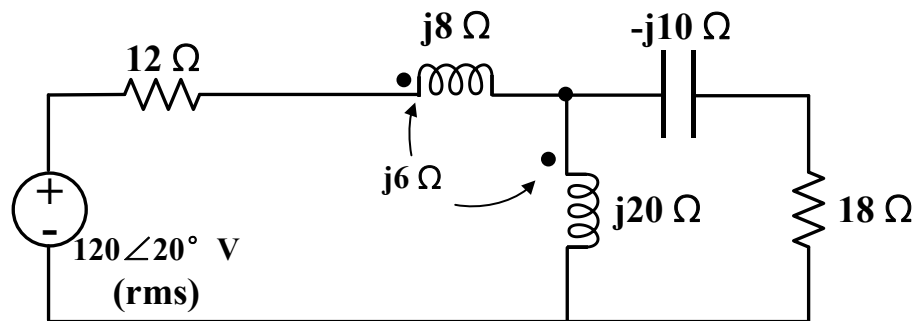
Q6 (15 points). **(General 2nd-order circuits)**

Given no initial energy was stored for the energy storage elements, *use Laplace domain method* **OR** *time-domain analysis method* to find output voltage v_o for $t > 0$.
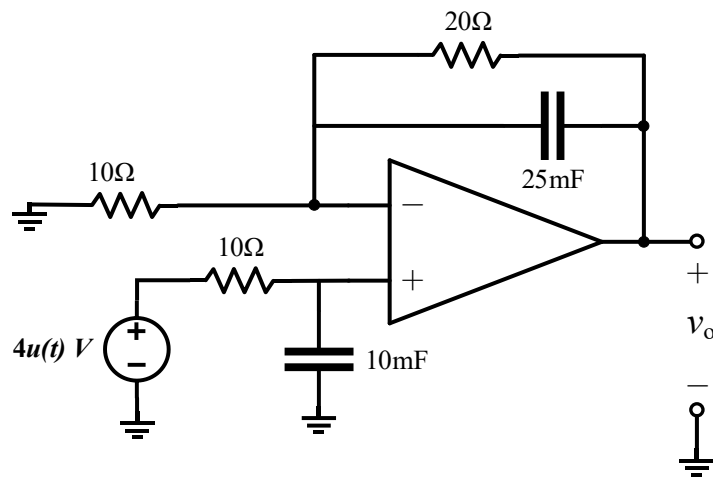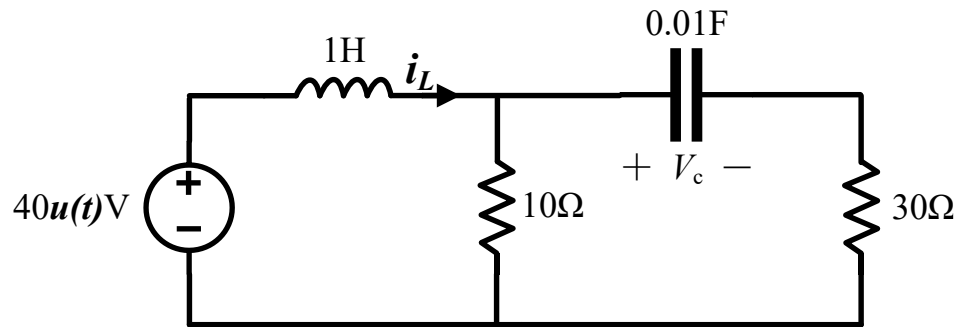
Q7(18 points)

When $t=0$, the current through the inductor is **6A** and no initial energy is stored for the capacitor.

(1) Find $i_L(t)$ for $t > 0$ by **Laplace domain method**.

(2) Find $i_L(t)$ for $t > 0$ by **time-domain method.**

Scratch Paper -1

Scratch Paper -2

Scratch Paper -3