INTERNATIONAL UNIVERSITY OF EAST AFRICA

'Learning to Succeed'

FACULTY OF ENGINEERING

END OF SEMESTER EXAMINATIONS - APRIL 2025

PROGRAMME: BACHELOR OF PETROLEUM ENGINEERING

YEAR/SEM: YEAR 1/SEMESTER 2

COURSE CODE: ELE1231

NAME: ELECTRICAL PRINCIPLES II

DATE: 2025-04-14

TIME: 2:00-5:00PM

INSTRUCTIONS TO CANDIDATES:

1. Read the instructions very carefully
2. The time allowed for this examination is STRICTLY three hours
3. Read each question carefully before you attempt and allocate your time equally between all the Sections
4. Write clearly and legibly. Illegible handwriting cannot be marked
5. Number the questions you have attempted
6. Use of appropriate workplace examples to illustrate your answers will earn you bonus marks
7. Any examination malpractice detected will lead to automatic disqualification.

DO NOT WRITE ANYTHING ON THE QUESTION PAPER

Section A In this section A, Answer any 3 Questions. Each Question is 20 Marks.

Question 1:

- What is the meaning of Low Pass Filter (LPF).
- Draw the frequency response and the phase shift of the Low-pass *RL* network
- Draw the R-L circuit implementation of the LPF simple. Drive the relation between the input and output of the circuit.
- What is the cut-off frequency of the filter. Derive an expression for the LPF cut-off frequency.

Question 2:

- Find the h parameters, h_{11}, h_{12}, h_{21} and h_{22}, of the circuit shown in Figure 1
- Note: In case of using h parameters, the input and output voltages and currents are related by the equations:
- $v_1 = h_{11} i_1 + h_{12} v_2$ ...(i)
- $i_2 = h_{21} i_1 + h_{22} v_2$ ...(ii)

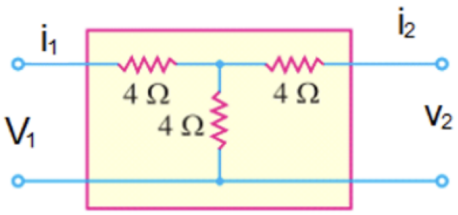

Figure 1

Question 3:

a. Calculate the necessary resistor value (R1) in the circuit of Figure 6 to give it a voltage gain of 30:

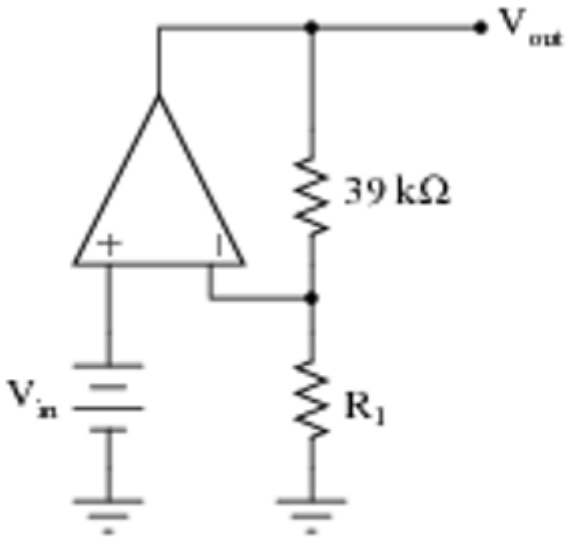

Figure 6

b. Calculate the voltage gain for each stage of the amplifier circuit of Figure 7 (both as a ratio and in units of decibels), then calculate the overall voltage gain:

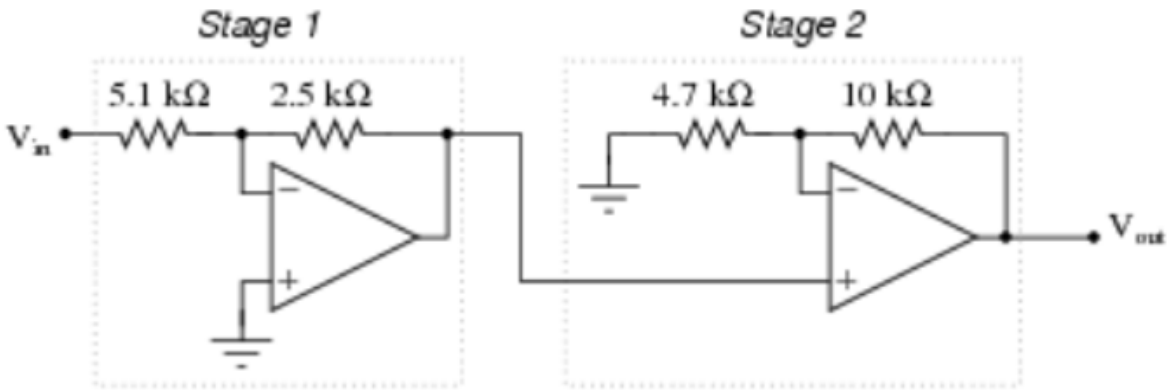

Figure 7

Question 4:

It is required to design a logic circuit that has three inputs A, B, C and one output Z. The output will be â??1â?• if two or more of the input signals are 1â??s.

- Construct the truth table
- Write the logic function that describes the relation between the inputs and the output in the Sum of Product (SOP) form
- Find the minimum form of the relation using Karnaugh Map.
- Draw the logic circuit that implements the relation.

Section B In this section B, Answer any 2 Questions. Each Question is 20 Marks.

Question 1:

a. Consider Figure 2, calculate the voltage gain for each stage of this amplifier circuit (both as a ratio and in units of decibels), then calculate the overall voltage gain:

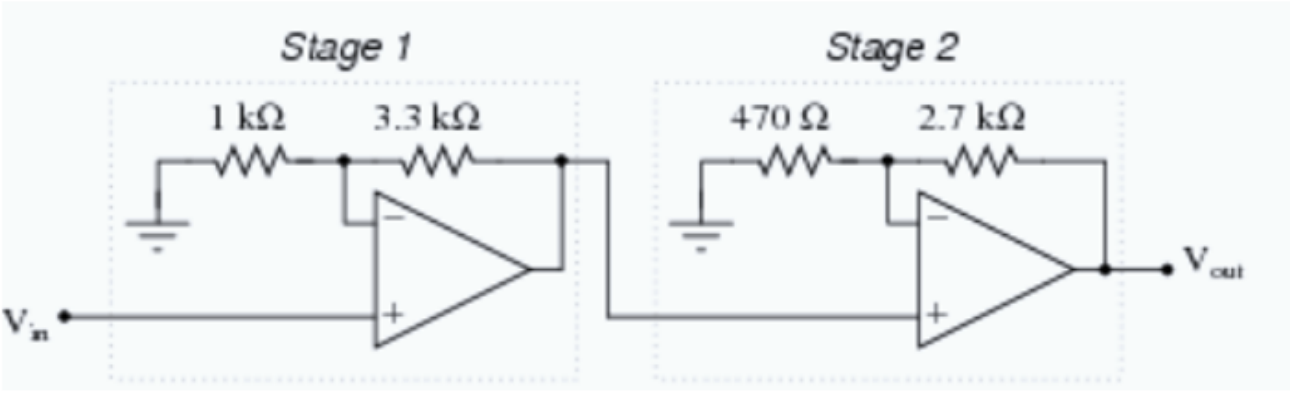

Figure 2

b. For the difference amplifier circuit shown, determine the output voltage at terminal A.

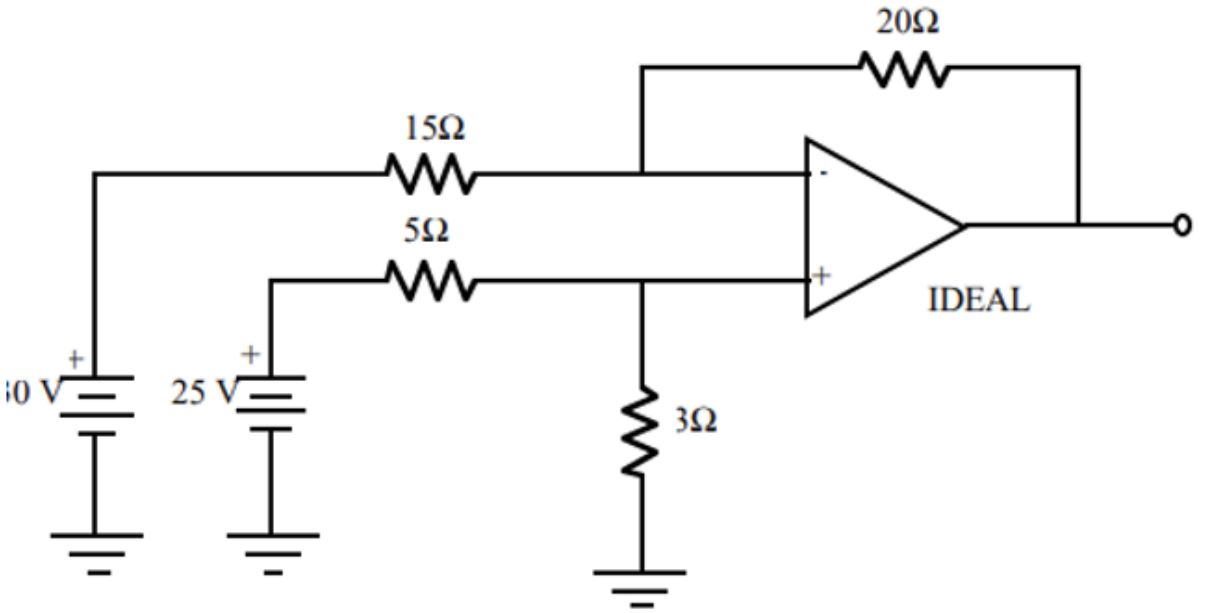

Figure 3

Question 2:

- Convert the decimal number $(457)_{10}$ to base 7
- The number $(654)_7$ is written in base 7, find its

Question 3:

- What is the meaning of High Pass Filter.
- Draw the frequency response and the phase shift characteristics of a high-pass *RC* network
- Draw the R-C circuit implementation of the HPF simple. Drive the relation between the input and output of the circuit.
- What is the cut-off frequency of the filter. Derive an expression for the HPF cut-off frequency.

Question 4:

It is required to design a logic circuit that has three inputs A, B, C and one output Z. The output will be â??1â?• if two or more of the input signals are 0â??s.

- Construct the truth table
- Write the logic function that describes the relation between the inputs and the output in the Sum of Product (SOP) form
- Find the minimum form of the relation using Karnaugh Map.
- Draw the logic circuit that implements the relation.