



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER**

**SCHOOL OF PURE, APPLIED AND HEALTH
SCIENCES**

**BACHELOR OF SCIENCE (PHYSICS)/ BACHELOR
OF EDUCATION (MATHEMATICS/PHYSICS,
CHEMISTRY/PHYSICS, BIOLOGY/PHYSICS,
COMPUTER/PHYSICS)**

**COURSE CODE: PHY 2213-1
COURSE TITLE: ELECTRICAL CIRCUITS**

DATE: 16/4/2024

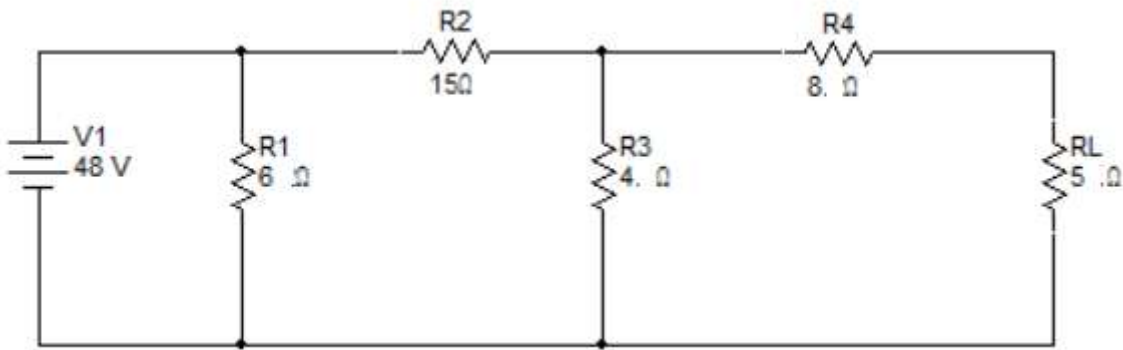
TIME:0830-1030 HRS

INSTRUCTIONS

- Answer Question ONE [20marks] and any other TWO [10MARKS EACH].
- Use of sketch diagrams where necessary and brief illustrations are encouraged.
- Read the instructions on the answer booklet keenly and adhere to them.

QUESTION ONE (20MARKS)

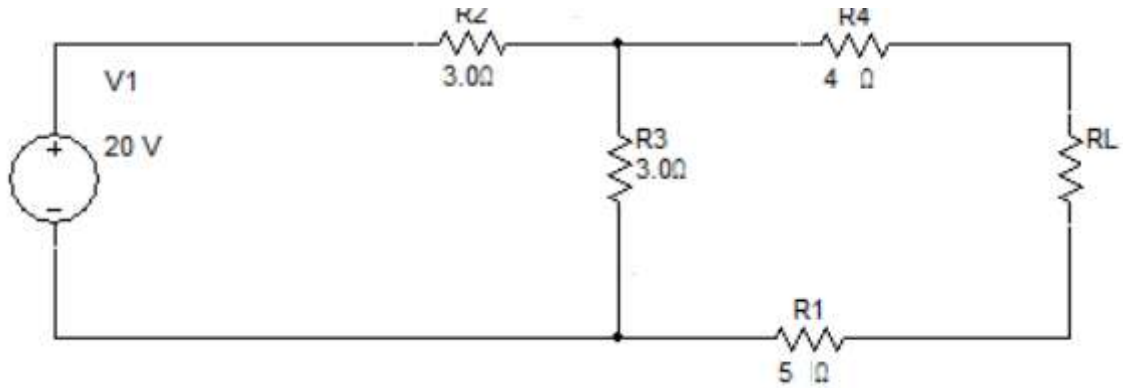
- a) Briefly describe with the aid of circuit diagrams
- Super node and super mesh (2 marks)
 - Ideal and practical voltage source (2 marks)
- b) Briefly explain the difference between
- Linear and nonlinear circuit elements (2 marks)
 - Bilateral and unilateral circuit elements (2 marks)
 - Lumped and distributed circuit elements (2 marks)
- c) Given the following circuit, describe the steps for determination of Thevenin's voltage, V_{th} and Thevenin's Resistance, R_{th} (6 marks)



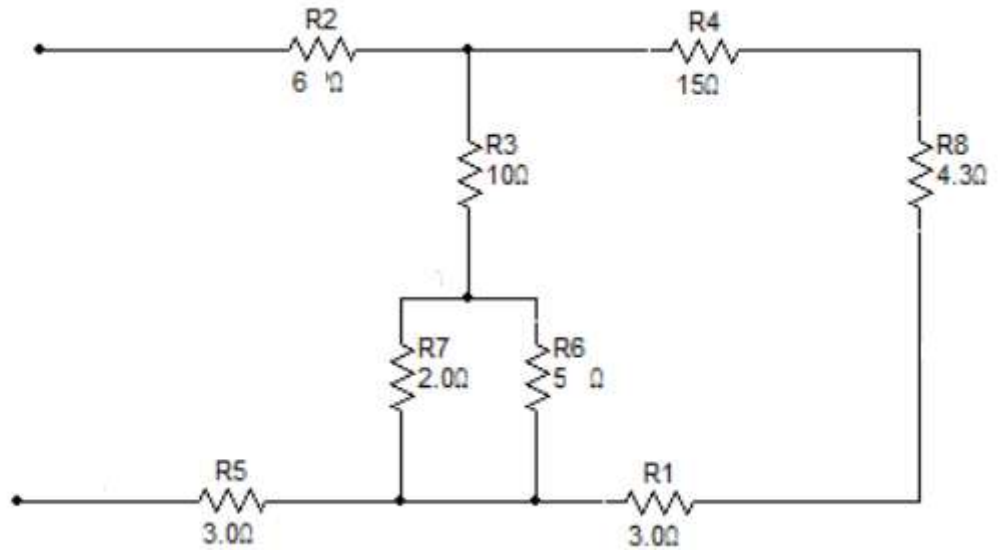
- d) By use of illustrative diagrams, explain a loop and a mesh. (4 marks)

QUESTION TWO (10 MARKS)

- a) State Maximum power transfer theorem and use it to find the value of R_L such that maximum power will be transferred to R_L in the circuit below. (6 marks)



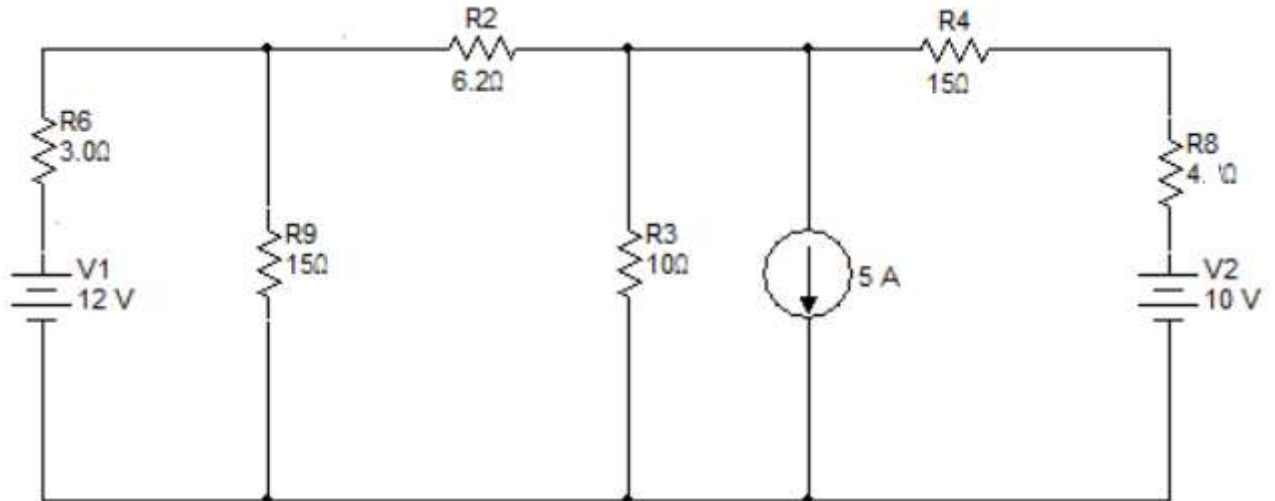
b) Determine equivalent resistance in the arrangement shown below (4 marks)



QUESTION THREE (10MARKS)

a) Outline the steps for solving a network by utilizing Reciprocity theorem (3 marks).

b) By use of nodal analysis, determine node A and B voltages in the circuit below (4 marks)



c) State Voltage-Current relationships in:

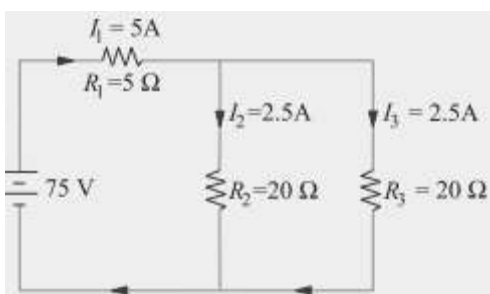
- i) Resistive circuit (1 mark)
- ii) Inductive circuit (1 mark)
- iii) Capacitive circuit (1 mark)

QUESTION 4 (10 MARKS)

a) Explain the differences

- i) Conductance and resistance (2 marks)
- ii) Admittance and impedance (2 marks)

b) By the use of compensation theorem, calculate the values of new currents when the resistor is increased by 30% in the circuit shown below. (4 marks)



c) Define Norton's theorem as it applies to DC circuits. (2 marks)

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