higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE: ELECTRICAL DRAUGHTING

(8080625)

8 December 2023 (X-paper)
09:00–12:00

REQUIREMENTS: Drawing paper, a calculator and drawing instruments

Computer-aided drawing software and/or drawing equipment may be used.

This question paper consists of 4 pages and 4 diagram sheets.

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TIME: 3 HOURS

MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Read ALL the questions carefully.

2. Answer all the questions (theory and drawings) on drawing paper (no separate ANSWER BOOK is required for answering any of the questions).

3. Number the answers according to the numbering system used in this question paper.

4. Marks will be allocated for:

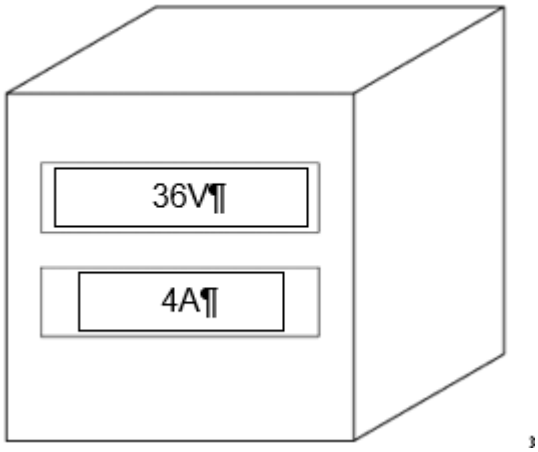
   4.1 Balanced layout and size
   4.2 Correctness
   4.3 Lettering
   4.4 Line work and neatness

5. Write neatly and legibly.

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QUESTION 1: GENERAL THEORY

Study the drawing of an electrical meter below, that is connected to a 36 V battery.



1.1 Draw the circuit diagram, with graphical symbols, to show how the meter above is correctly connected in a circuit. (7)

1.2 What is the voltage reading on the meter? (1)

1.3 What is the current reading on the meter? (1)

1.4 What is the resistance of the circuit? (3)

1.5 What is the power consumption of the circuit? (3)

1.6 Name ONE application for this kind of meter. (2)

1.7 Is the meter a direct current or alternating current meter? Give ONE reason for your answer. (3)

[20]

QUESTION 2: GRAPHICAL SYMBOLS AND ELECTRONIC DIAGRAMS

FIGURE 1 on DIGRAM SHEET 1 shows a simple 12-volt regulator circuit, with an IC2 7812 voltage regulator IC and other components.

Draw the circuit diagram with the transformer in place, with the correct IEC graphical symbols and with labels for each component. **[20]**

QUESTION 3: GENERATION AND DISTRIBUTION OF ELECTRICITY

FIGURE 2 on DIAGRAM SHEET 2 represents a residential layout of a grid-tied PV system.

Draw a fully labelled block diagram of a grid-tied PV reticulation system.

The drawing must include the following:

- Power plant
- Transmission line (HT)
- Substation
- Low voltage
- Meter
- AC breaker panel (DB Board)
- Grid-tied inverter
- Solar panels (PV Panels)
- Arrows to show current flow

NOTE: A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships between the blocks. **[20]**

QUESTION 4: ELECTRICAL MOTORS AND CONTROL DEVICES

FIGURE 3 on DIAGRAM SHEET 3 is a 3-phase wiring diagram for the main supply distribution board of a building. The circuit shown is used to check/test the main voltage and the current of the supply.

Redraw the complete circuit and, where possible, improve the circuit layout.

Draw the main (power) circuit and the testing circuit together (as given) and improve or complete the item designation so that the final drawing will be ready for reproduction. **[20]**

QUESTION 5: WIRING OF PREMISES

FIGURE 4 on DIAGRAM SHEET 4 represents a schematic layout of a single-phase distribution board for a typical building.

- Make use of the given layout and draw a fully labelled electrical diagram of a single-phase distribution board by interconnecting the necessary graphic symbols.
- Add all required circuit breaker ratings and wire sizes to the drawing.
- No names for any of the sub-circuits (stove, lights etc.) need to be shown.
- A legend must accompany the drawing to declare all graphical symbols. **[20]**

TOTAL: 100

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DIAGRAM SHEET 1

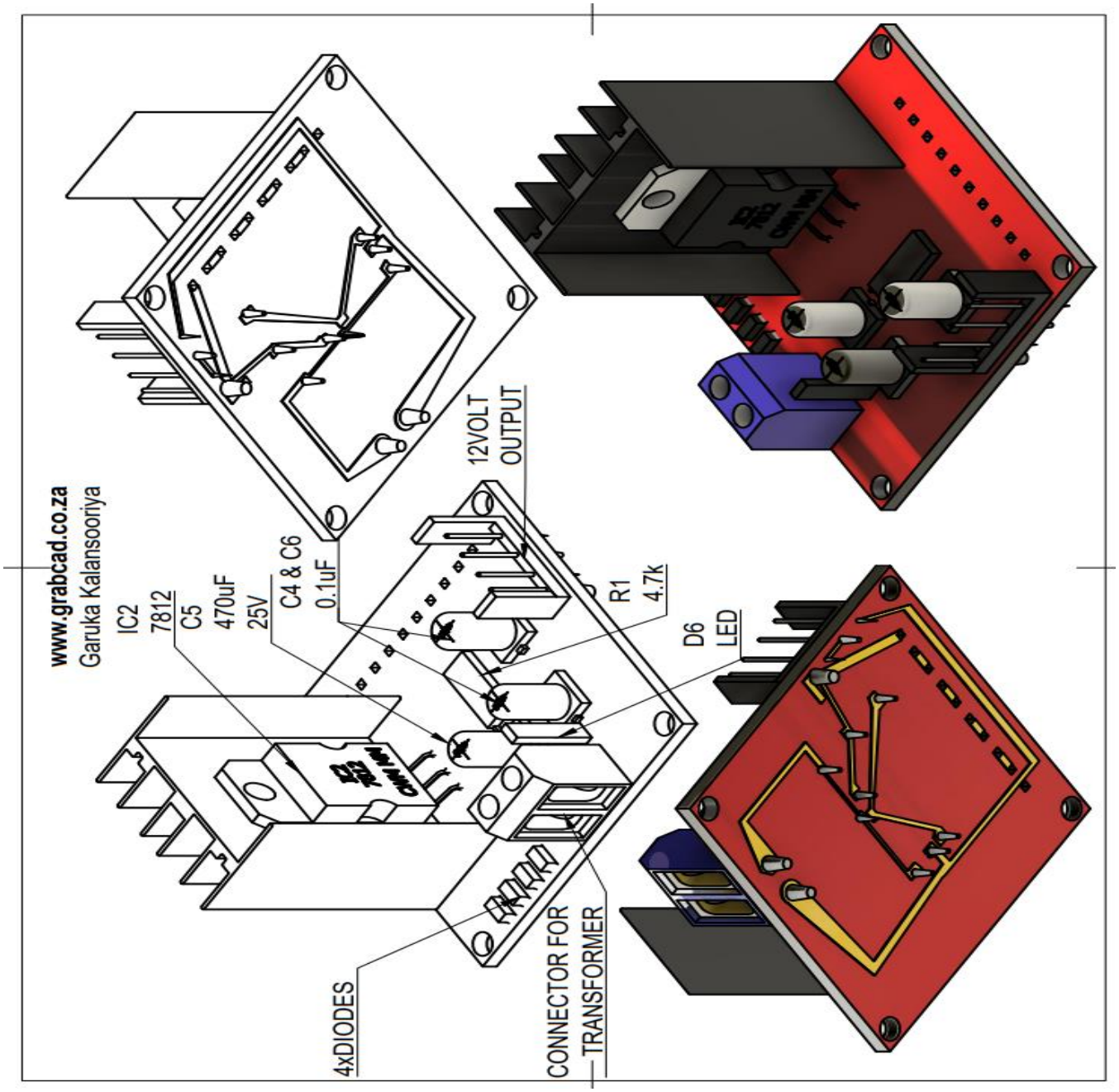


FIGURE 1

T1 - 220 V to 12 V 250 mA transformer (not shown)
D5 - 4 × 1N4001 diodes
C4 - 0.1uF capacitor
C5 - 470uF 15V capacitor
C6 - 0,1uF capacitor
R13 - 4.7kΩ resistor
D6 - red LED
IC2 - 7812

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DIAGRAM SHEET 2

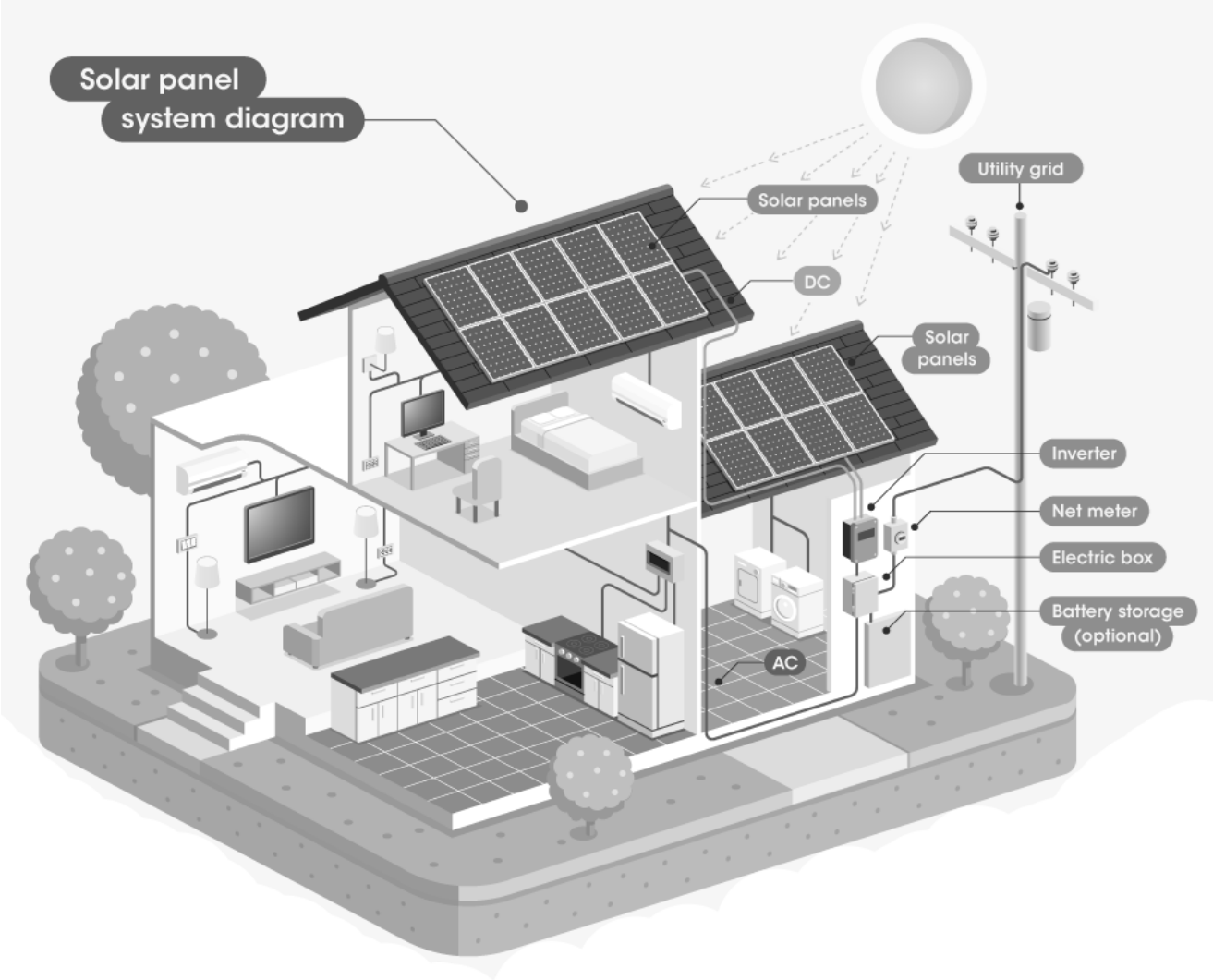


FIGURE 2

DIAGRAM SHEET 3

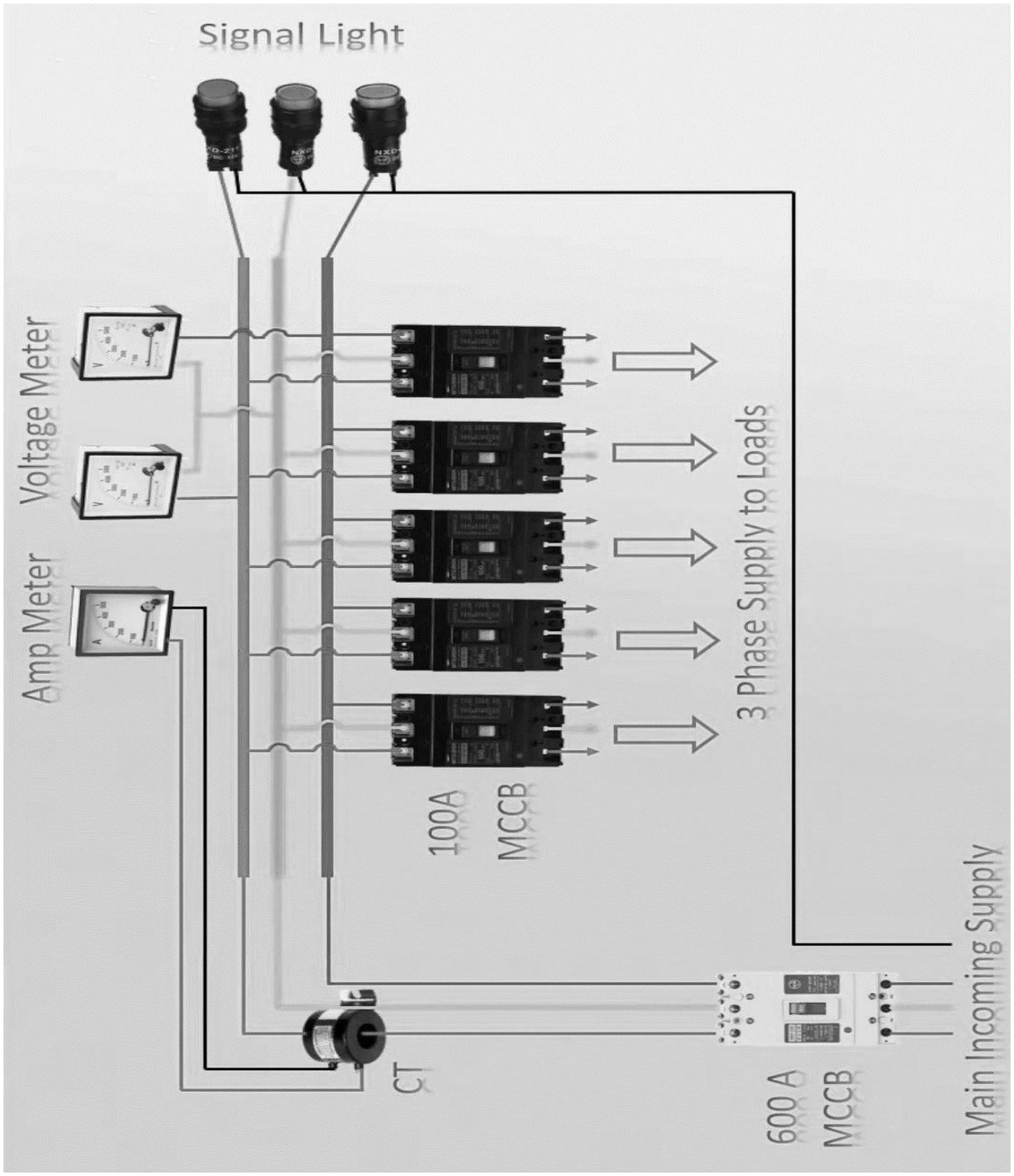


FIGURE 3

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DIAGRAM SHEET 4

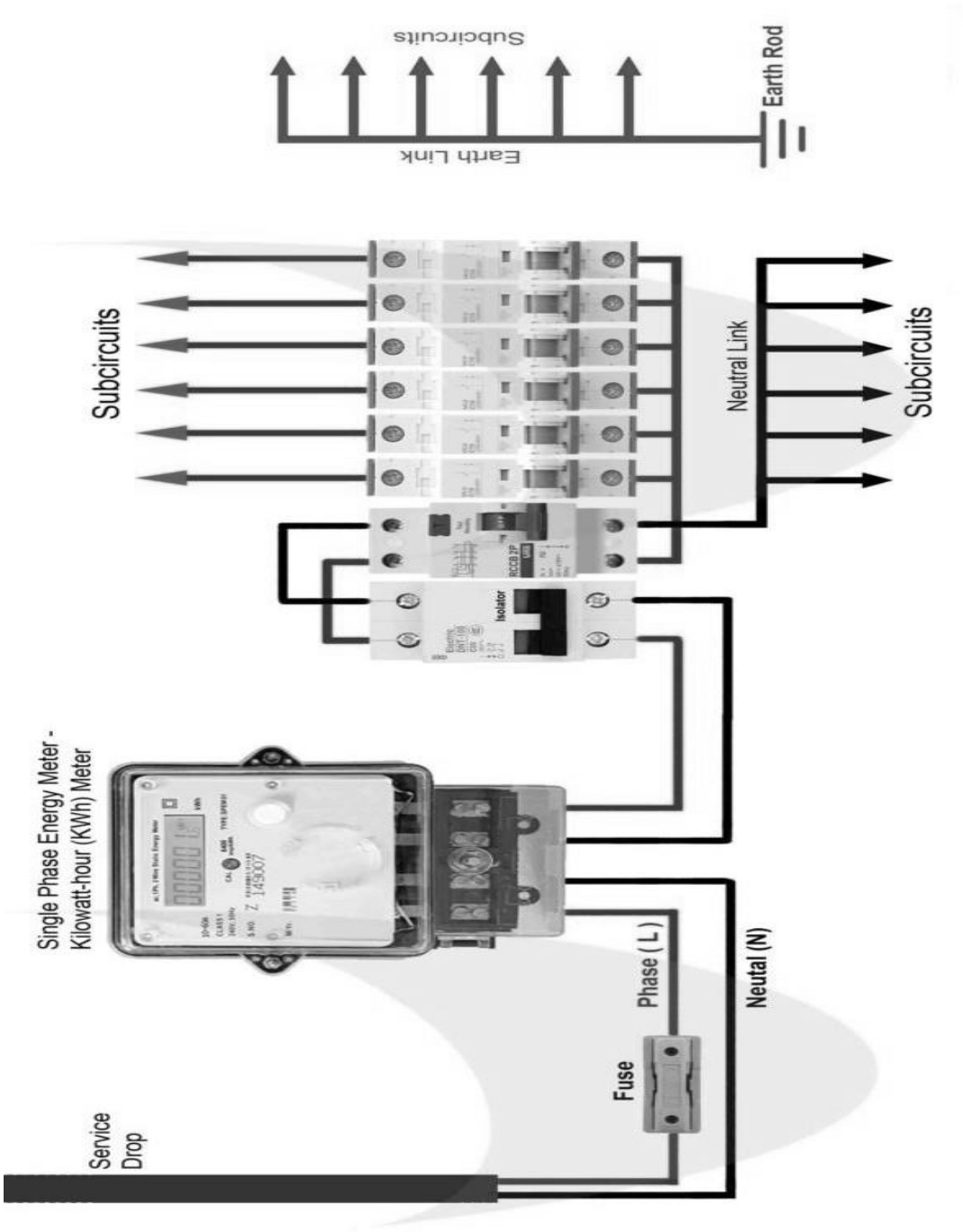


FIGURE 4

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