higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE: ELECTRICAL DRAUGHTING

(8080625)

18 November 2020 (X-paper)
09:00–13:00

REQUIREMENTS: **Drawing paper, a calculator and drawing instruments.**

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

This question paper consists of 5 pages and 4 diagram sheets.

135Q1E2018

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MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE:
ELECTRICAL DRAUGHTING
TIME: 4 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. Work neatly.

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QUESTION 1: GENERAL THEORY

1.1 Write the conductor sizes in mm^2 that are suitable for each of the following circuits or sub-circuits in a small household electrical installation.

1.1.1 Main supply

1.1.2 Cooking appliance (stove)

1.1.3 Geyser

1.1.4 Socket outlets (power points)

1.1.5 Illumination (lights)

(5 × 1) (5)

1.2 Name THREE factors that determine the electrical resistance of a conductor. (3)

1.3 A three-phase transformer has a maximum rating (S) of 200 kVA.

Calculate the maximum line current that should not be exceeded if the line voltage is 380 V.

Hint: $S = \sqrt{3} \times V_L \times I_L$ (3)

1.4 1.4.1 Explain briefly what is meant by the term *stroboscopic effect* and give ONE practical example of this phenomenon. (2)

1.4.2 Explain a risk (danger) associated with the stroboscopic effect and how it can be reduced. (2)

1.5 Copy and complete the following table of electrical quantities and standard units.

Electrical Quantity	Standard Unit
…	Kilowatt
…	Hertz
Reactance	…
Impedance	…
Energy	…

(5)
[20]

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QUESTION 2: GRAPHICAL SYMBOLS AND ELECTRONIC DIAGRAMS

DIAGRAM SHEET 1 represents a freehand drawing (circuit diagram) of a simple microprocessor boot loader.

Draw the circuit diagram with the correct IEC graphical symbols with labels for each component and the table (functions of switches) so that the completed drawing will be ready for reproduction. **[20]**

QUESTION 3: GENERATION AND DISTRIBUTION OF ELECTRICITY

DIAGRAM SHEET 2 represents a schematic 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 tie 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

DIAGRAM SHEET 3 shows a three-phase wiring diagram for the main supply distribution board of a building.

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/complete the item designation so that the final drawing will be ready for reproduction. **[20]**

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QUESTION 5: WIRING OF PREMISES

DIAGRAM SHEET 4 represents a schematic layout of three single-phase distribution boards 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 graphical symbols.

Add all required circuit breaker ratings and wire sizes to the drawing.

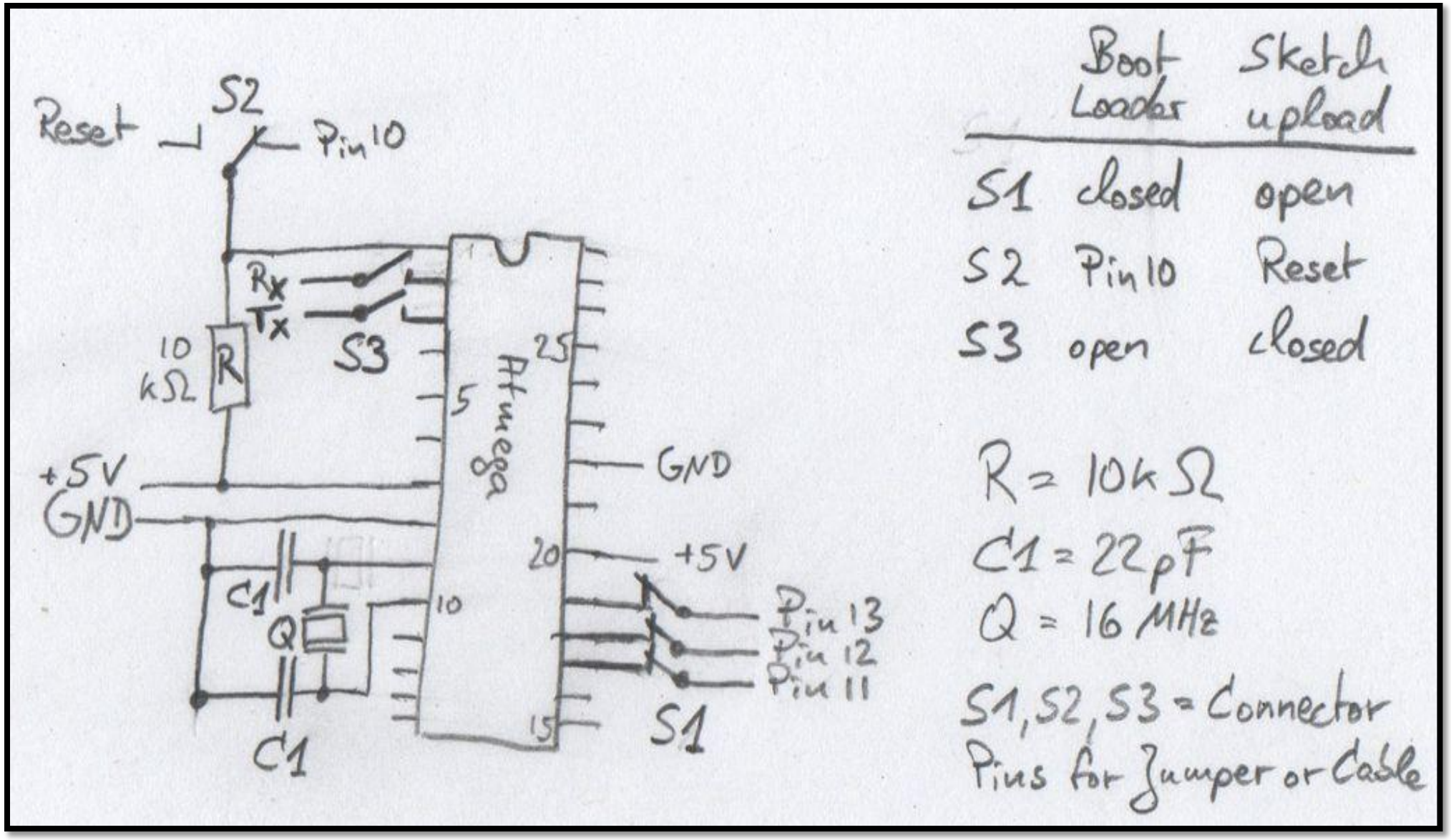
No names for any of the sub-circuits (e.g., stove, lights etc.) need to be shown.

A legend must accompany the drawing to declare all graphical symbols. **[20]**

TOTAL: 100

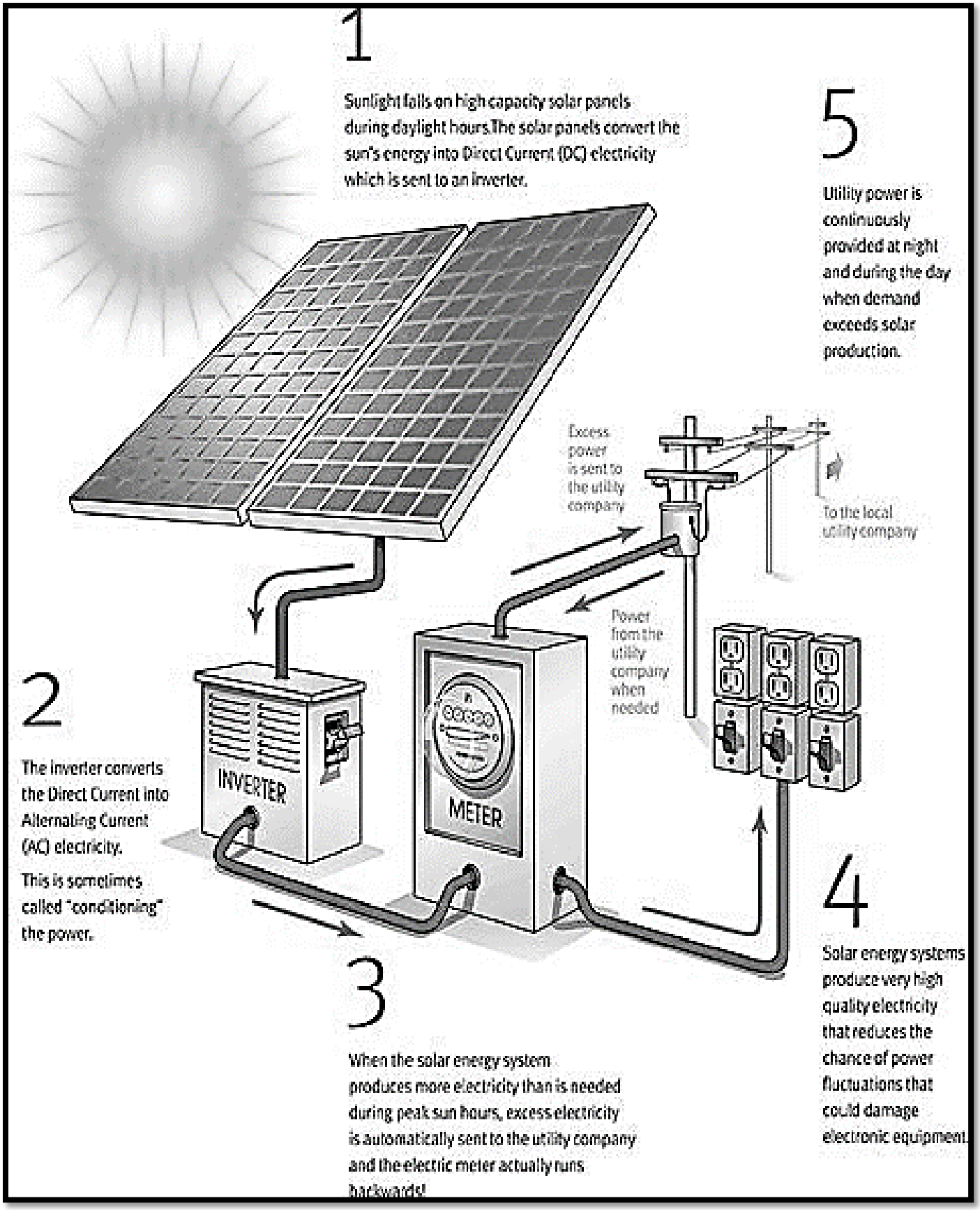
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DIAGRAM SHEET 1



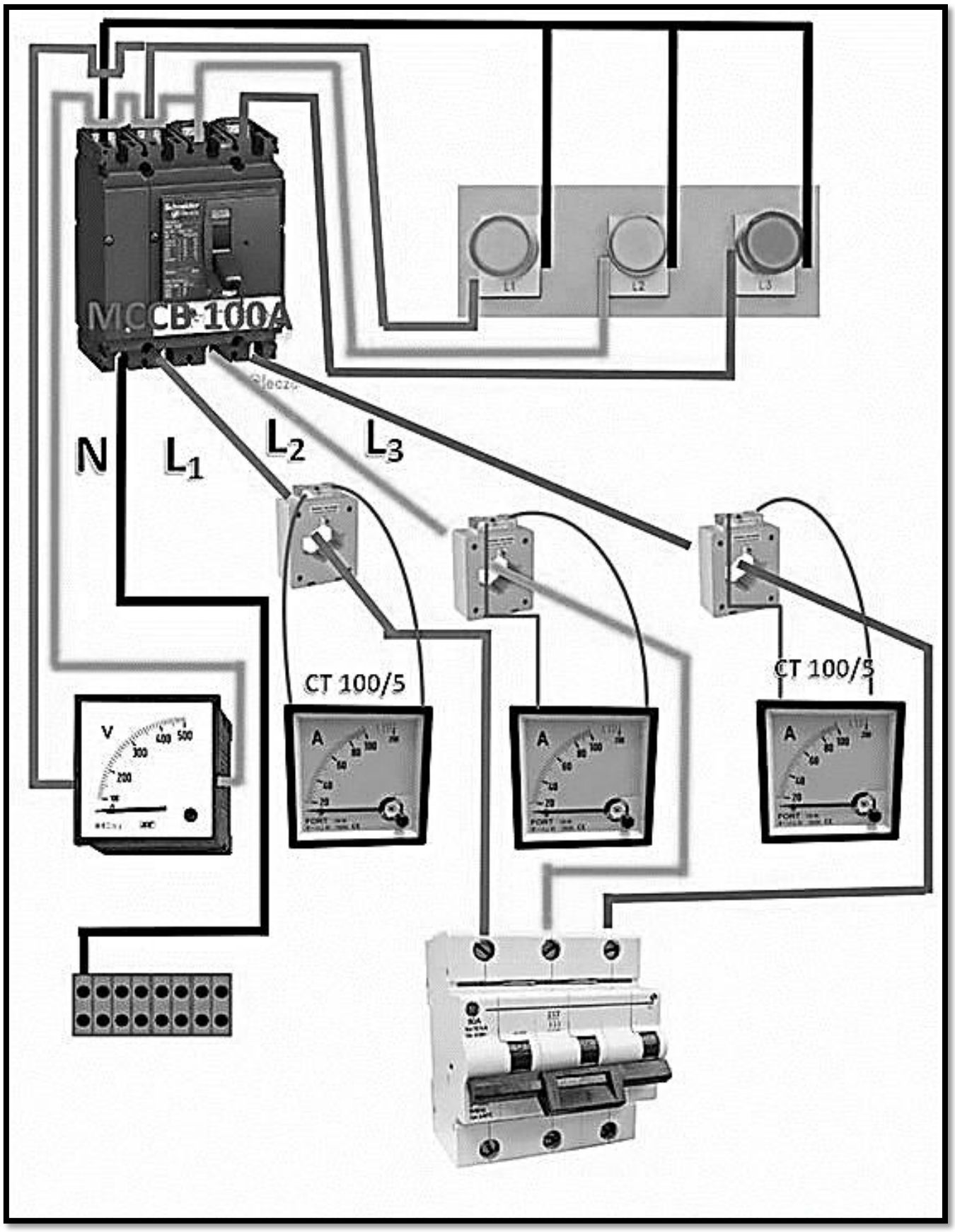
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DIAGRAM SHEET 2



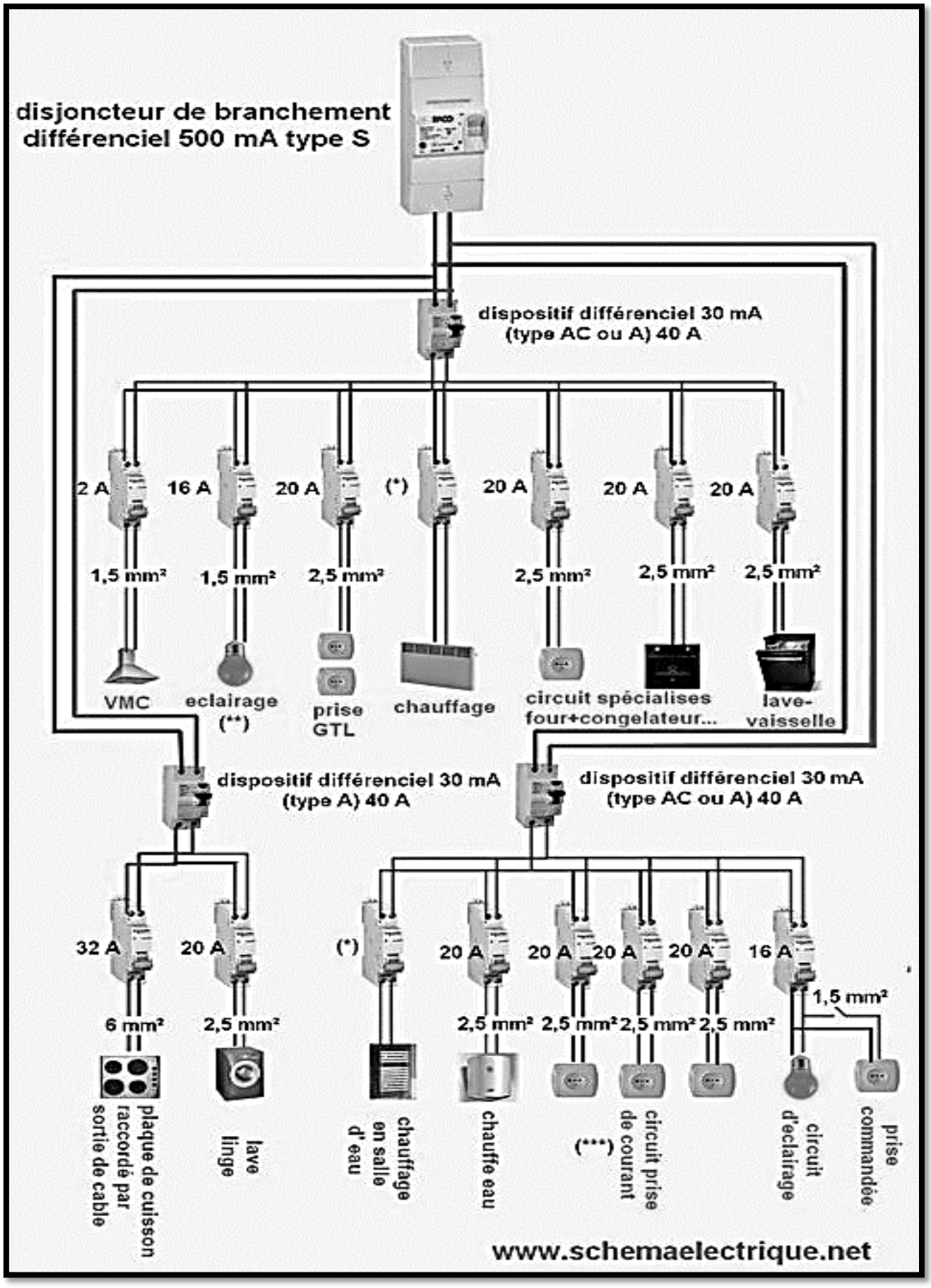
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DIAGRAM SHEET 3



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DIAGRAM SHEET 4



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