

0202/213
TRADE THEORY
June/July 2023
Time: $2\frac{1}{2}$ hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
ARTISAN CERTIFICATE IN ELECTRICAL INSTALLATION
ELECTRICAL INSTALLATION TRADE THEORY

$2\frac{1}{2}$ hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Drawing instruments;

Mathematical tables/non-programmable calculator.

This paper consists of TWO sections; A and B.

Answer ALL the questions in section A and any FOUR questions from section B in the answer booklet provided.

Candidates should answer the questions in English.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (40 marks)

Answer ALL the questions in this section.

1. State four career opportunities available in the electrical field. (4 marks)
2. Distinguish between an ammeter and voltmeter. (4 marks)
3. (a) Draw a schematic diagram of a wattmeter connected to a load.
(b) Determine the power dissipated when a current of 20 A flows in resistor of $2\ \Omega$. (4 marks)
Handwritten: $A=20A$, $R=2\ \Omega$, $P=\frac{20^2}{2}=100W$
4. An electric heater consumes 4.8 MJ when connected to 240 V supply for 40 minutes. Determine the:
(a) power rating of the heater;
(b) current taken from the supply. (4 marks)
Handwritten: $W=4.8MJ$, $V=240V$, $T=40min$
5. List two properties of a series connected circuit. (4 marks)
6. Figure 1 shows an electrical circuit.

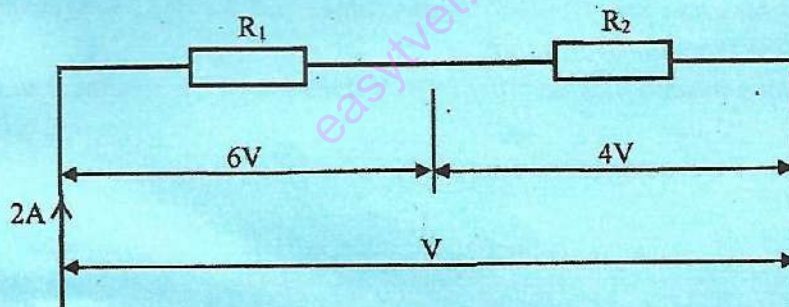


Fig. 1

Determine the:

- (a) total supply voltage;
 - (b) value of each resistor. (4 marks)
- Handwritten: $\frac{R_1+R_2}{V}$*

7. Explain how each of the following affects the resistance of a conductor:
- (a) length of the conductor;
 - (b) cross section area.
- (4 marks)
8. Name **four** constructional parts of a lead acid cell. (4 marks)
9. Draw a labelled construction diagram of a double wound transformer. (4 marks)
10. Draw a labelled line diagram showing the sequence of equipment at the consumers intake point. (4 marks)

SECTION B (60 marks)

Answer FOUR questions from this section.

11. (a) Name **four** parts of D.C generator. (4 marks)
- (b) Explain each of the following terms as used in a.c circuits:
- (i) periodic time;
 - (ii) frequency.
- (4 marks)
- (c) An alternating voltage V has a periodic time of 0.02 S and peak value of 40 V.
Write the expression of the instantaneous voltage in the form;
- $$V = V_m \sin(\omega t \pm \phi)$$
- $V \Rightarrow 40 \sin[0.8\omega \pm \phi]$*
- (3 marks)
- (d) Draw graphical symbols of each of the following:
- (i) fuse;
 - (ii) lamp;
 - (iii) switch;
 - (iv) variable resistor.
- (4 marks)

12. (a) State **four** advantages of moving iron instruments. (4 marks)
- (b) Draw a labelled diagram of a moving coil instrument. (5 marks)
- (c) (i) Explain the reason for carrying out insulation resistance test.
- (ii) State the **two** insulation resistance tests done on electrical cables.
- (iii) State the reading obtained and instrument used in (c) (ii). (6 marks)
13. (a) State **four** factors that determine the capacitance of a capacitor. (4 marks)
- (b) Figure 2 shows an electric circuit.

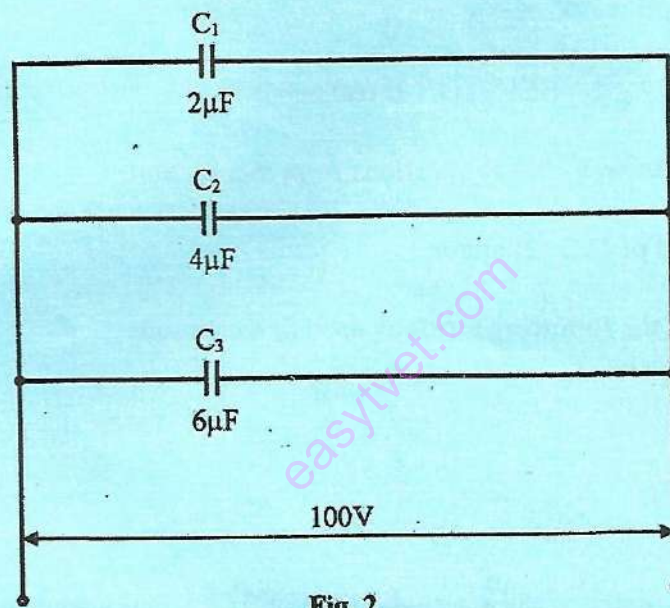


Fig. 2

Determine the:

- (i) total circuit capacitance;
- (ii) total charge;
- (iii) charge on 2 µF capacitor. (6 marks)
- (c) Name **five** tools used in the installation of steel conduit work. (5 marks)

* Pipe
* Wipe
* Crow
* Hammer

14. (a) Draw the circuit diagram showing the position of a three heat switch for an electric cooker when in:
- (i) off position;
 - (ii) high position.

(6 marks)

- (b) Figure 3 shows a diagram of an incandescent lamp. Identify the parts labelled A, B, C and D. (4 marks)

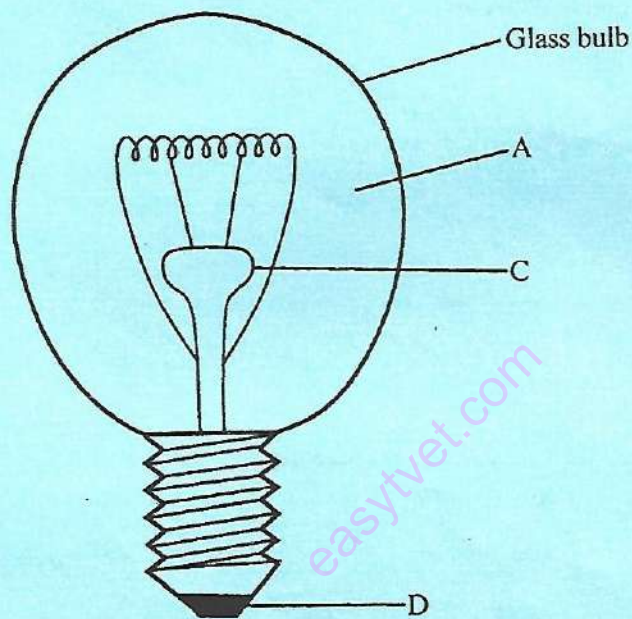


Fig. 3

- (c) Draw a wiring diagram of a lighting circuit with two lamps A and B operated by switch S_1 and lamp C operated by switch S_2 (5 marks)
15. (a) Distinguish between the job descriptions of a class C_2 and class C_1 license holders. (4 marks)
- (b) Outline the procedure of obtaining an electricians license online in Kenya. (6 marks)
- (c) Draw a labelled typical power transmission and distribution line diagram in Kenya. (5 marks)

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