

0202/213  
ELECTRICAL INSTALLATION  
TRADE THEORY  
June/July 2021  
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:*

*Answer booklet;*

*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.*

*Maximum marks for each part of a question are as indicated.*

*Candidates should answer the questions in English.*

**This paper consists of 4 printed pages.**

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



**SECTION A (40 marks)**

*Answer ALL the questions in this section.*

1. List **four** types of electrical licenses in Kenya. (4 marks)
2. Draw a labelled diagram of the atomic structure of aluminium atom (4 marks)
3. (a) Outline **four** characteristics of a parallel circuit with resistors only. (2 marks)  
(b) Name **two** circuit conditions experienced in Electrical engineering. (2 marks)
4. (a) Define each of the following terms as used in alternating circuits:  
(i) instantaneous value;  
(ii) peak value. (2 marks)  
(b) A sine-wave equation is given by  $V=120 \sin \theta$ . Determine the average value of the voltage. (2 marks)
5. (a) List **two** electrical components in a half wave rectifier circuit. (2 marks)  
(b) List **two** measuring instruments used in electrical work. (2 marks)
6. Differentiate between conductors and insulators. (4 marks)
7. (a) State **two** areas of applications of capacitors. (2 marks)  
(b) State **two** factors that determine the capacitance of a capacitor. (2 marks)
8. (a) List **four** types of energy conversions in a generating power station. (2 marks)  
(b) State **two** reasons why voltage is stepped-up for transmission purposes. (2 marks)
9. State **four** factors that affect the resistance of a material. (4 marks)
10. (a) Name **four** areas an artisan can be employed. (2 marks)  
(b) An iron box is rated 2000 W. Determine the resistance of the element if the terminal voltage is 250 V. (2 marks)



SECTION B (60 marks)

Answer **FOUR** questions from this section.

11. (a) (i) Name **three** types of fuses. (3 marks)
- (ii) A fuse has a fusing factor of 1.45 and a current rating of 18 A. Determine the fusing current. (3 marks)
- (b) (i) Draw a labelled circuit diagram of a fluorescent lamp. (9 marks)
- (ii) State the function of each part in (b)(i) above.
12. (a) (i) Define the term 'transformer' as used in electrical engineering. (2 marks)
- (ii) Draw a labelled diagram of shell type transformer. (3 marks)
- (b) State the function of each of the parts of a dc motor:
- (i) commutator;
  - (ii) armature;
  - (iii) stator coils;
  - (iv) brushes;
  - (v) terminals.
- (5 marks)
- (c) Draw a labelled diagram of a Buzzer bell. (5 marks)
13. (a) (i) State **three** advantages of circuit breakers over fuses. (3 marks)
- (ii) Name **three** sources of direct current. (3 marks)
- (b) **Figure 1** shows an electric circuit.

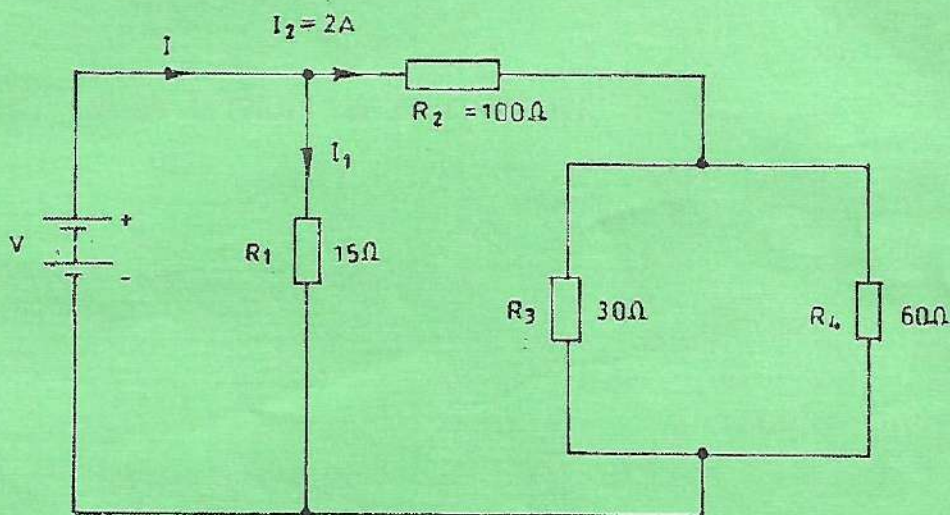


Fig.1



Determine the:

- (i) supply voltage (V);
  - (ii) supply current, (I);
  - (iii) power dissipated by  $15 \Omega$  resistor. (9 marks)
14. (a) State **four** factors that determine the strength of an electro-magnetic field. (4 marks)
- (b) The total capacitance of  $C_1$  and  $C_2$  when connected in series is  $20 \mu\text{F}$  and when connected in parallel is  $90 \mu\text{F}$ . Determine the value of  $C_1$  and  $C_2$ . (8 marks)
- (c) Draw a circuit diagram of a lamp controlled by 2-2 way switches. (3 marks)
15. (a) Draw a labelled diagram of a sine-wave. (4 marks)
- (b) An AC voltage is given by  $V = 150 \sin \theta$ . Determine the following:
- (i) rms value of voltage;
  - (ii)  $\theta$  when  $V = 75 \text{ V}$ ;
  - (iii) peak to peak voltage. (7 marks)
- (c) (i) Define the term 'polarization'.  
(ii) Explain how polarisation can be minimised in primary cells. (4 marks)

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