

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
March/April 2023
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONIC TECHNOLOGY
(POWER OPTION)
(TELECOMMUNICATION OPTION)

MODULE I

ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Non-programmable scientific calculator;

Answer booklet.

This paper consists of EIGHT questions in TWO sections; A and B.

Answer any THREE questions from section A and any TWO questions from section B.

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

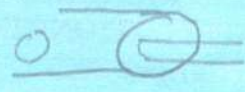
Candidates should answer the questions in English.

This paper consists of 6 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: ELECTRICAL INSTALLATION TECHNOLOGY

Answer **THREE** questions from this section.



✓

- (a) (i) Describe **three** parts of an electric cable. conductor.
insulation.
↓
- (ii) State **three** reasons why copper material is widely used in electrical cables. (6 marks)

20
20
20

- (b) Explain each of the following methods of jointing cables:

3
2

- (i) mechanical jointing;
- (ii) soldering. (4 marks)

4

- (c) (i) State **three** factors that affect the resistance of an electrical conductor;
- (ii) A P.V.C cable 20 m long supplies a consumer unit from the intake point. The cross sectional area of the cable is 10 mm². Determine the resistance of this cable. Take resistivity of this conductor as $0.03 \times 10^{-6} \Omega \text{m}$. (5 marks)

$$R = \frac{\rho L}{A}$$

- (d) Figure 1 shows a type of joint of an electrical cable;

S
15

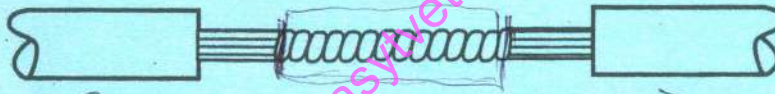


Fig. 1

- (i) Name the type of joint.
- (ii) Outline the procedure of making the joint. (5 marks)

15
16
31
10
41

2. (a) State **three**

6

- (i) merits of thermal power stations.
- (ii) factors considered when citing the power station in a(i). (6 marks)

- (b) Draw circuit diagrams of each of the following distributions systems:

- (i) A.C two wire;
- (ii) D.C two wire.



(4 marks)

Cross-section

Fusion of

(c) State **two** functions of each of the following power authorities: ✓

(i) Kenya generation company.

(ii) Energy and petroleum regulatory authority.

(4 marks)

(d) Draw a labelled line diagram showing the voltage levels from generation to consumer points in Kenya.

(6 marks)

generation
High voltage
secondary

3. (a) State **three** I.E.E regulation requirements regarding:

(i) Consumer supply intake point;

(ii) Lighting circuits.

(6 marks)

(b) With the aid of a labelled diagram, explain the operation of a water heater thermostat.

(5 marks)

(c) Figure 2, shows the layout of a two roomed house.

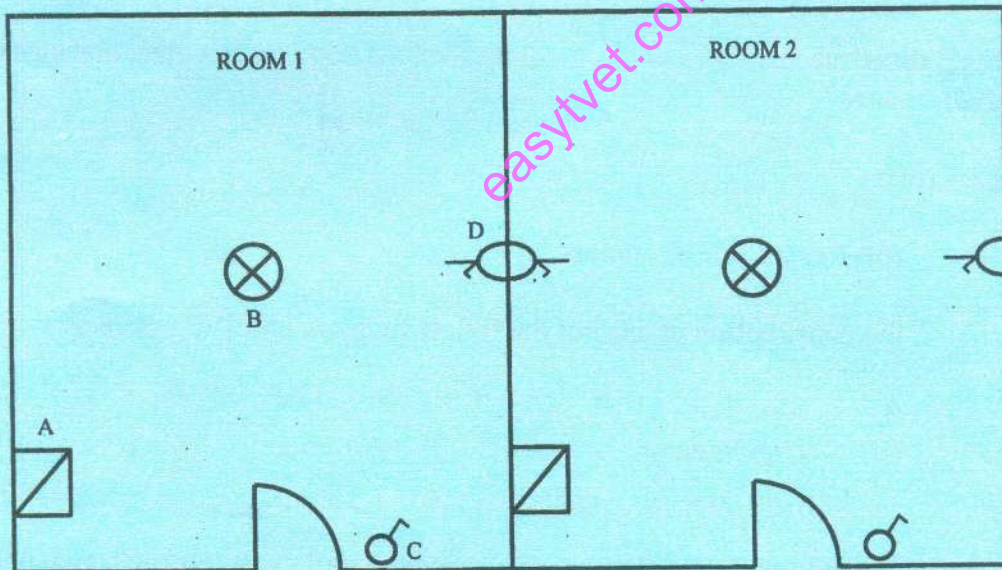


Fig. 1

(i) Identify the symbol labelled A, B, C and D.

(ii) Using the joint box method, draw the wiring of the lighting final circuit for the two rooms supplied from A.

(9 marks)

1 Δ
2 Δ
3 C
4 C
5 P
6 P
7 f

A.

(a) State **three**

- (i) causes of fire in electrical installations;
- (ii) IEE regulation requirements regarding electrical switch gear.

6

(6 marks)

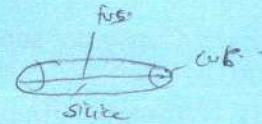
(b) Explain each of the following terms used in electrical protection:

- (i) fusing factor;
- (ii) discrimination.

2

(4 marks)

(c) (i) Draw a labelled diagram of a cartridge fuse.



(ii) State **two** merits of the fuse in c(i).

(5 marks)

(d) (i) Explain the term bonding as applied in Earthing systems;

(ii) Illustrate the parts of an earthing system.

(5 marks)

(a) State **three** mechanical and electrical inspections done on electrical machines during maintenance.

(6 marks)

(b) Describe:

- (i) **three** types of D.C motors.
- (ii) the construction of each of the following parts of a D.C machine:

- (I) Yoke;
- (II) Cummutator.

(7 marks)

(c) (i) Draw a schematic diagram of a capacitor start capacitor run single phase induction motor.

(ii) State **three** merits of the motor in c(i).

(7 marks)

M.S
T6

S

3

5.

20
15
35

LD

Fusing

S
T = I
N T N S

TNT

SECTION B: SOLAR INSTALLATION TECHNOLOGY

Answer **TWO** questions from this section.

6. (a) Outline the maintenance procedure carried out on a P.V solar module. (5 marks)
- (b) State three factors considered when sizing:
- (i) charge controller;
- (ii) P.V module. (6 marks)
- (c) (i) Describe 'total daily energy demand' of a P.V solar system.
- (ii) Outline the procedure of determining the total daily energy demand. (7 marks)
- (d) The total energy demand for a domestic house is 240 watthours. The system voltage supplied is 12 V d.c. Determine the total charge of the battery in ampere hours per day. (2 marks)
7. (a) (i) Describe each of the following accessories used in P.V solar installation:
- (I) ceiling roses;
- (II) lamp holders.
- (ii) State **two** types of lamps recommended for P.V solar lighting. (6 marks)
- (b) (i) Describe the construction features of a monocrystalline solar cell.
- (ii) Outline **three** merits of alkaline batteries. (6 marks)
- (c) With reference to energy regulations governing P.V solar installation, state the role of each of the following license holders.
- (i) Class T1;
- (ii) Class T2 (4 marks)
- (d) Draw a labelled wiring diagram of a P.V solar installation to supply a 240 V A.C system. (4 marks)

8. ✓ (a) Define the following solar energy terminologies:
- 2 (i) solar constant;
(ii) diffuse radiation. 2 (4 marks)
- (b) State two:
- 4 (i) Areas of application of a solar-heat energy;
(ii) methods of harvesting solar heat energy. 4 (4 marks)
- (c) Describe the following types of solar cookers:
- 2 (i) box cooker;
(ii) concentrating type cooker; 2
(iii) solar steam cooker. 10 (6 marks)
- 3 (d) Illustrate the earthing of a P.V solar module. (6 marks)

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