

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./ Nov. 2021
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 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 5 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

Answer any **THREE** questions from this section.

1. (a) State:

- (i) **two** reasons for earthing an electrical installation.
- (ii) **three** ways of how earthing is achieved.

(7 marks)

(b) Outline **three** characteristics of the following fuses:

- (i) rewirable fuse;
- (ii) high rupturing capacity fuse.

(6 marks)

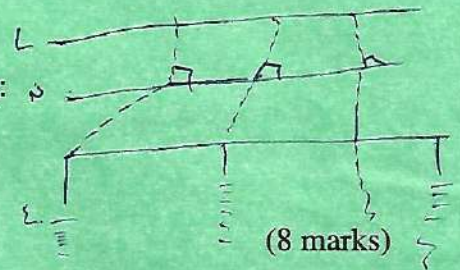
(c) With the aid of a circuit diagram, describe the earth fault loop path.

(7 marks)

2. (a) (i) Define the term 'cable'.

(ii) State **three** characteristics of each of the following:

- (I) conductor, — Conductivity, — Easy to join
- (II) insulator, — It's flush. — Does not conduct



(8 marks)

(b) Describe the following cable jointing methods:

- (i) clamping;
- (ii) crimping.

(4 marks)

(c) (i) Sketch a Ballhanger's joint.

(ii) Outline the procedure of making the joint in c(i).

(8 marks)

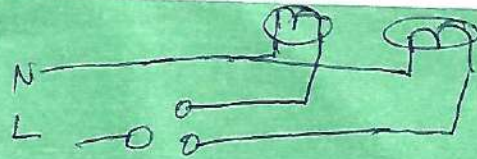
3. (a) State **two**:

(i) advantages of hydro-electric power stations.

(ii) hydro-electric generating stations in Kenya.

— Power can be stepped up or down
— Easy to maintain
— Nanyuki — Narok
(Bondu miria) — Mwingi

(4 marks)



- (b) Illustrate the following:
- (i) 3-wire d.c. distribution system.
 - (ii) three phase, 4 - wire a.c distribution systems.

(10 marks)

- (c) (i) Outline **two** reasons for carrying out insulation resistance test in electrical installation.
- (ii) State the instrument used and expected readings when carrying out insulation resistance test in c(i).

(6 marks)

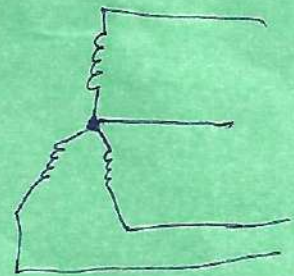
4. ✓

- (a) With the aid of a diagram, explain 'loop-in' method as used in lighting circuits.

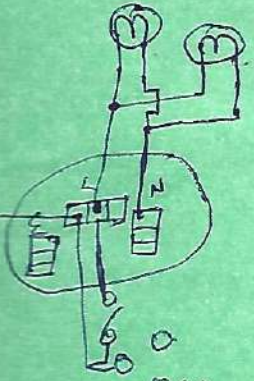
(4 marks)

- (b) State **four** IEE regulation requirements regarding:

- (i) ring sockets;
- (ii) cable sizes for:
 - (I) bell circuits; 2.5
 - (II) lighting circuits; 1.5
 - (III) power circuits; 6.0
 - (IV) cooker control circuits. 4.0



(8 marks)



- (c) (i) Illustrate how two lighting points can separately be controlled using 3-plate ceiling rose.

- (ii) Outline **two** I.E.E regulation requirements regarding ceiling roses.

— All termination of wires
 — One core
 * Must be fitted with an earth
 (8 marks)

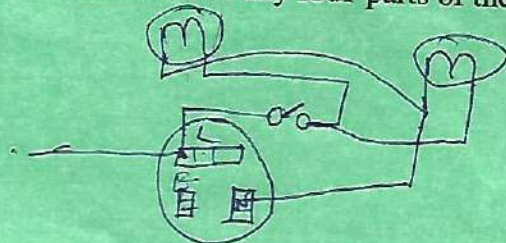
5. (a) Outline the procedure for dismantling a three phase induction motor for maintenance.

(4 marks)

- (b) (i) Draw a labelled constructional diagram of a d.c machine.

- (ii) State the functions of any **four** parts of the machine in b (i).

(8 marks)



- (c) Draw a labelled electric circuit diagram of a capacitor start, capacitor run single phase induction motor. (4 marks)
- (d) State **two**:
- (i) visual inspection checks conducted on a d.c machine;
 - (ii) tests carried out on a d.c. machine.

(4 marks)

SECTION B: SOLAR INSTALLATION TECHNOLOGY

Answer any TWO questions from this section.

6. ✓ (a) State **two**:
- (i) advantages of using solar electric power over other conventional systems.
 - (ii) factors that determine the amount of energy produced by a solar module. (4 marks)
- (b) With the aid of a diagram, describe the operation of a solar cell. (5 marks)
- (c) (i) With the aid of a diagram, describe the construction of a solar box cooker.
- (ii) State **two** advantages of the cooker in c(i). (8 marks)
- (d) Outline **three** reasons for sizing solar installation system. (3 marks)
7. ✓ (a) State **four** factors considered when choosing a wiring system for solar installation. (4 marks)
- (b) A solar system has four solar batteries each rated 12V/4A. Draw the connection circuit for the output to give:
- (i) 16 A;
 - (ii) 4 A. (6 marks)
- (c) State **two** possible causes and remedies for the following solar installation faults.
- (i) battery lasts few hours;
 - (ii) dim lights. (8 marks)
- (d) Explain the term 'stand alone' as used in solar systems. (2 marks)

8. (a) Explain the following terms as used in solar systems:

- (i) tracking;
- (ii) depth of discharge of battery. →

(4 marks)

(b) A trader in Kajiado is to install a 12 V solar PV system in his house to power the following loads shown in table 1.

Table 1

Appliance	Qty	Watts	Hours/ day
LED bulbs	2	15	2
Security light	1	30	6
LEDTV	1	70	3
Decoder	1	15	3
DVD player	1	35	2

TOTAL

Handwritten calculations:
60v
180v
210v
45v
70v
565
180
340
210
450
45
495
70
565

Determine the:

- (i) total watt-hour per day;
- (ii) size of the solar panel required;
- (iii) size of the fuse required to protect the system.

Take daily insolation = 5.66 and total losses = 74%

(10 marks)

(c) Explain the cable requirements for the following d.c solar installation:

- (i) low voltage d.c systems;
- (ii) installation exposed to sunlight.

(4 marks)

(d) State the functions of the following accessories in solar installations:

- (i) switches;
- (ii) sockets.

(2 marks)

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