

Name _____ Index No _____

1601/105

Candidate's Signature _____

1602/105

ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY

June/July 2015

Time: 3 hours



Date _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONICS ENGINEERING
(POWER OPTION)
(TELECOMMUNICATION OPTION)**

ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY

3 hours

**INSTRUCTIONS TO CANDIDATES**

Write your name and index number in the spaces provided above.

Sign and write the date of this examination in the spaces provided above.

You should a scientific calculator/Mathematical tables for this examination.

This paper consists of TWO sections; A and B.

Answer any THREE questions from section A and any TWO questions from section B in the spaces provided in this question paper.

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

Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
Total Score			

This paper consists of 20 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

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

1. (a) (i) List the consumer's and Kenya power company equipment found at the consumer intake point.
(ii) State the IEE regulation requirements regarding switch-gear and consumers equipment at intake point. (5 marks)
- (b) A long corridor is lit by three lamps and controlled from four different positions, draw a wiring diagram for this arrangement. (5 marks)
- (c) (i) Explain **two** reasons for testing an installation.
(ii) List **three** situations which warrant the test in c(i). (5 marks)
- (d) (i) With the aid of a labelled diagram show how polarity test is carried on a lighting circuit with supply off.
(ii) State the instrument used, and the reading expected in d(i). (5 marks)
2. (a) Explain the meaning and function of the following authorities in power production:
(i) G.D.C;
(ii) KETRACO;
(iii) REA. (6 marks)
- (b) (i) State **two** advantages of A.C and D.C systems.
(ii) Name **two** electricity generating stations in Kenya. (4 marks)
- (c) Draw the following distribution systems:
(i) D.C three wire;
(ii) A.C four wire. (10 marks)
3. (a) List **three** properties of a good:
(i) conductor;
(ii) insulator. (6 marks)



- (b) State:
- (i) **two** reasons why copper is coated with tin;
 - (ii) **three** precautions to be taken with open busbar systems. (5 marks)
- (c) Explain the effects of voltage drop in electrical installation. (2 marks)
- (d) With the aid of a sketch, show how a Tee-joint is formed. (7 marks)
4. (a) Draw a labelled diagram of a cartridge fuse and state three of its rating and colour codes. (6 marks)
- (b) Explain the conditions under which the following types of earth electrodes are used
- (i) copper plate;
 - (ii) copper rod;
 - (iii) copper tape. (6 marks)
- (c) With the aid of a labelled diagram describe the earth resistance test. (8 marks)
5. (a) With the aid of circuit diagrams differentiate between series, shunt and compound motors. (8 marks)
- (b) Describe **four** main parts of a D.C machine. (8 marks)
- (c) Draw a labelled diagram of a capacitor start capacitor run single phase induction motor. (4 marks)



SECTION B

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

6. (a) Distinguish between direct and diffuse radiation in solar systems. (4 marks)
- (b) Explain how solar concentrates and reflectors help in harvesting solar energy giving an example in each case. (6 marks)

(c) (i) State **two**:

(I) advantages of using box cookers;

(II) types of solar water heaters.

(ii) With the aid of a labelled diagram explain the working principle of a solar cell. (10 marks)



7. (a) Distinguish between a voltage converter and ac-dc inverter. (4 marks)

(b) Explain how the following enhances the amount of light and brightness of a room.

(i) reflectors;

(ii) white paint.

(6 marks)

(c) (i) With the aid of a labelled diagram explain how a solar module is earthed.

(ii) Explain the importance of earthing a solar installation.

(10 marks)

8. (a) Outline how the state of charge of a battery is measured using a:

(i) voltmeter;

(ii) hydrometer.

(6 marks)

(b) Explain **two** possible causes for each of the following failures in a solar installation:

(i) solar charge indicator does not light up during the day;

(ii) the appliances connected do not work when connected to the supply.

(4 marks)

(c) A solar technician gathered data from a farmer to install solar electric system for his two bedroom house in Kitui;

- sitting room, 1 lamp 10w 12v d.c, daily use 4 hours;
- kitchen 1 lamp, 10w 12v d.c, daily use 3 hours;
- bedroom 1, 1 lamp 9w 12v d.c, daily use 3 hours;
- bedroom 2, 1 lamp 9w 12v d.c, daily use 1 hour;
- 1 radio, 10w 9v d.c, daily use 3 hours;
- 1 coloured TV, 80w 240v A.C, daily use 2 hours.

Insert the data in the table 1 and determine the total daily use energy demand.

(10 marks)

Table 1

Column A Lamp or appliance	Column B Voltage (volts)	Column C Power (watts)	Column D Daily use (hours)	Column E Daily demand (watts hours)	Column F Total daily energy demand
1 lamp	12v	10w d.c	4h	40w	

