

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
June/July 2017
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/Mathematical tables;

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.

All questions carry equal marks.

Maximum marks for each part of a question are 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.

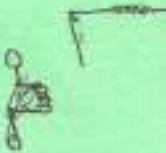
SECTION A: ELECTRICAL INSTALLATION

Answer **THREE** questions from this section.

1. (a) (i) Define the term 'final circuit';
- (ii) State **three** IEE regulation requirements for 13 A socket outlets wired in ring. (4 marks)
- (b) With the aid of a labelled diagram, show the sequence of supply at consumer's intake point. Indicate both the supply authority equipment and consumers equipment. (8 marks)
- (c) Table 1 shows the tests carried out in a completed installation. Complete the table by filling the test instrument and the expected reading in the spaces provided for each type of test. (8 marks)

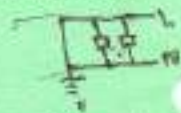
Table 1

TEST	INSTRUMENT	READING
POLARITY		
INSULATION RESISTANCE		
CONTINUITY		
EARTHING TEST		



2. (a) Write in full the following abbreviations as regards to power production authorities in Kenya:

- (i) G.D.C.; *Gen. Dir. of Electricity*
- (ii) KENGEN; *Kenya Generation Station*



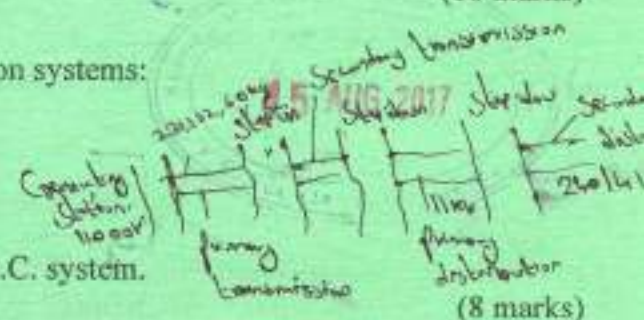
(2 marks)

- (b) (i) List **four** types of power generating stations found in Kenya and for each, name **one** site location. *Kenya power station, Kengen*
- (ii) Draw a line diagram showing the distribution and transmission of power from generating station to a consumer indicating voltage levels at each stage. (10 marks)

- (c) (i) Draw the following power distribution systems:

- (I) A.C. single phase two wire;
- (II) D.C. two wire.

- (ii) State **two** advantages of A.C. over D.C. system.



(8 marks)

3. (a) State three:
- IEE regulations requirements regarding cables;
 - properties of copper that make it a good choice for electrical conductors.
- (6 marks)
- (b) Explain the following soldering methods:
- blow lamp;
 - pot and laddle.
- (6 marks)
- (c) Draw a labelled diagram of a three core VRI cable. (4 marks)
- (d) Calculate the cross-sectional area of a cable when indicated labelled as $\frac{7}{0.6742}$. (4 marks)



4. (a) Define the following terms as used in protection:

- fusing factor;
- current rating.



(4 marks)

- (b) (i) Draw a labelled diagram of a high breaking capacity fuse.
 (ii) State **two** advantages of the fuse in b (i).



(7 marks)

- (c) (i) Explain how earthing is achieved for extra low voltages to offer protection against dangerous earth leakage current.
 (ii) Illustrate how **two** dangerous conditions could arise if P.M.E. system is used in an installation.
- (9 marks)

5. (a) (i) Draw a labelled diagram of a d.c. machine.
 (ii) Describe the construction of the following parts of a d.c. generator:
- the yoke;
 - armature.
- (9 marks)
- (b) Outline the procedure of carrying out routine inspection on a d.c. motor. (5 marks)
- (c) With the aid of circuit diagrams, distinguish between an induction start induction run and capacitor start induction run a.c. motors. (6 marks)

SECTION B: SOLAR INSTALLATION TECHNOLOGY

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

6. (a) State **three**:
- (i) benefits of using solar energy over other renewable energy sources;
 - (ii) solar energy conversions. (6 marks)
- (b) With aid of diagrams, explain how solar energy is harvested using:
- (i) box reflectors;
 - (ii) parabolic dish. (8 marks)
- (c) (i) Draw a labelled diagram of a box cooker.
- (ii) State **two** advantages of the cooker in c (i). (6 marks)
7. (a) Explain the following terms used in solar technology:
- (i) array;
 - (ii) PV solar module. (4 marks)
- (b) State **three** factors considered when:
- (i) carrying out wiring of solar installation; ✓
 - (ii) choosing location of a solar battery. (6 marks)
- (c) Explain the following terms as used in solar batteries:
- (i) deep discharge;
 - (ii) depth of discharge. (4 marks)
- (d) Draw a labelled block diagram of a PV solar system to supply both D.C. and A.C. loads (6 marks)



8. (a) Explain the following in relation to solar system sizing:

- (i) daily load energy demand;
- (ii) voltage drop.

(4 marks)

(b) State:

- (i) **three** important features of a charge controller;
- (ii) **two** factors to be considered when selecting a charge controller for a solar system.

→ prevent over discharge
 → positive terminal
 → Negative terminal
 → C-08
 → make sure of the calculation (5 marks)
 → current rating.

(c) Outline **three** possible causes for each of the following faults in a solar installation:

- (i) solar charge indicator does not light up during the day;
- (ii) lamps fail to light.

→ loss connection of charge controller
 → loss connection in the battery
 → the charge (6 marks)

(d) Outline the procedure for cleaning a solar battery during maintenance. (5 marks)

→ loss connection
 → the lamps are damaged
 → battery is low.
 Clean the surface with clean water.
 Use a soft brush to clean the surface.
 (14)

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