Name:_____ Index No:_____

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
June/July 2014
Time: 3 hours

Candidate's Signature:_____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONIC TECHNOLOGY (POWER OPTION) (TELECOMMUNICATIONS 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 examination in the spaces provided above.
You should have a scientific calculator and Drawing Instruments for this examination.
*This paper consists of **TWO** sections **A** and **B**.*
*Answer **THREE** questions in section A and **TWO** questions in section **B**, in the spaces provided in this question paper.*
Maximum marks for each part of a question are as shown.
Candidates should answer the questions in English.

$(\mu_o = 4\pi \times 10^{-7})\ H/m$

$\varepsilon_0 = 8.85 \times 10^{-12}\ F/m$

For Examiner's Use Only

Section	Question	Maximum Marks	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
TOTAL SCORE		100	

This paper consists of 16 printed pages.

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

Turn over

SECTION A

*Answer **THREE** questions from this sections.*

1. (a) Define the following terms as used in protection of electrical installations:

(i) overload current;
(ii) discrimination;
(iii) fusing factor. (6 marks)

(b) (i) With the aid of a circuit diagram, describe the operation of a current operated earth leakage circuit breaker (ELCB).

(ii) Describe the following terms as used in earthing tests:

(I) earth electrode resistance;
(II) earth-loop impedance. (10 marks)

(c) A final sub-circuit feeding socket outlets is protected by a re-wirable fuse rated at 30 A and its fusing factor is 2.0. The main fuse before CCU is rated at 40 A and it is a HBC fuse whose fusing factor is 1.25.

(i) determine the fusing currents of the two fuses;
(ii) comment on the suitability of this arrangement. (4 marks)

2. (a) (i) Distinguish between cable insulation and cable sheathing.

(ii) State **four** factors that influence the current ratings of a cable. (8 marks)

(b) (i) Define the term final circuit.

(ii) Describe **three** features of equipment at consumer's intake point. (8 marks)

(c) State:

(i) **two** advantages of miniature circuit breakers;

(ii) **two** disadvantages of re-wirable fuses. (4 marks)

3. (a) Using circuit diagrams, distinguish between a D.C two-wire and A.C two-wire distribution system. (6 marks)

(b) Draw a labelled diagram of a hydro-power generating plant and explain its operation. (10 marks)

(c) Draw a circuit to control a lighting point at three different positions using two-way and intermediate switches. (4 marks)

4. (a) Explain the functions of the following authorities for power production in Kenya:

(i) Kenya Power Company;
(ii) KenGen.

(4 marks)

(b) With the aid of a labelled diagram, explain the operation of an instant water heater. (8 marks)

(c) (i) State any **four** parts of a photo-voltaic system.

(ii) State **four** methods of solar energy harvesting.

(8 marks)

SECTION B

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

5. (a) (i) State **four** areas of application of solar energy.

(ii) Distinguish between flat plate and parabolic dish solar collectors stating one application of each. (10 marks)

(b) Explain the functions of the following in a solar wiring system:

(i) invertor;
(ii) charge controller.

(4 marks)

(c) (i) Define the term photo-voltaic.

(ii) State **four** routine maintenance procedures that need to be carried out on a solar charged battery cell. (6 marks)

6. (a) With the aid of a labelled diagram, explain the working principle of a solar cell.

(6 marks)

(b) Explain how the following factors affect the amount of solar radiation received on the earth's surface:

(i) geographical location;
(ii) time of the day.

(4 marks)

(c) Explain **five** factors to consider when choosing a wiring system. (10 marks)

7. (a) (i) State **three** causes of high resistance connections in cable joints and terminations.

(ii) State **three** methods of joining cables.

(6 marks)

(b) With the aid of a diagram, describe the method of forming a britannia joint.

(7 marks)

(c) (i) State **four** tests that should be performed on a final circuit.

(ii) State **three** accessories used in lighting circuits.

(7 marks)

8. (a) Draw a schematic diagram of a d.c machine and explain the following parts:

(i) stator;
(ii) rotor;
(iii) commutator.

(11 marks)

(b) With the aid of schematic equivalent circuit diagrams, describe the following classes of d.c motors:

(i) shunt motor;
(ii) series motor;
(iii) compound motor.

(9 marks)