

Name: _____ Index No.: _____

2601/105

2602/105

2603/105

ELECTRICAL AND SOLAR INSTALLATION

Oct./Nov. 2014

Time: 3 hours

Candidate's Signature: _____

Date: _____



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(POWER OPTION)

(TELECOMMUNICATION OPTION)

(INSTRUMENTATION OPTION)

ELECTRICAL AND SOLAR INSTALLATION

3 hours

Mdca I

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 the following for this examination:

Drawing instruments;

Mathematical tables/scientific calculator.

This paper consists of **TWO** sections; A and B.

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

All questions carry equal marks.

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: ELECTRICAL INSTALLATION (60 marks)

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

1. (a) Define the term 'wiring system'. (2 marks)
- (b) Explain how the following factors affect the selection of a wiring system:
- (i) environmental conditions;
 - (ii) appearance;
 - (iii) safety. (6 marks)
- (c) State **three**:
- (i) precautions necessary to be observed when installing a sheathed wiring system;
 - (ii) advantages of P.V.C conduits over metallic conduits; (6 marks)
- (d) (i) State two advantages of Aluminium conduits.
- (ii) Describe the cleat type of wiring system. (6 marks)
2. (a) Distinguish between the following terms as used in electrical installation:
- (i) switch fuse;
 - (ii) fuse switch. (2 marks)
- (b) State:
- (i) **four** IEE regulation requirements regarding socket outlets in a domestic wiring installation.
 - (ii) **three** switch gear apparatus at a consumers intake point. (7 marks)
- (c) Draw a labelled block diagram showing the sequence of control for a three phase industrial installation and supply up to a single phase distribution board. (7 marks)
- (d) With aid of a diagram, illustrate how two lamps can be controlled by single-pole switches independently using two three-plate ceiling roses. (4 marks)

3. (a) State **three** characteristics of a good cell. (3 marks)
- (b) Explain **three** ways of carrying out maintenance of batteries. (3 marks)
- (c) (i) With aid of a diagram explain the procedure of carrying out a cell voltage test on a battery.
- (ii) Outline **four** conditions which indicate a fully charged cell. (14 marks)
4. (a) State **three**:
- (i) methods of connecting an earthing lead with earth in an installation.
- (ii) factors that affect the value of earth electrode resistance. (6 marks)
- (b) List **four** tests carried out in a completed installation and state the test equipment used in each case. (8 marks)
- (c) With aid of a diagrams, illustrate how a three pin socket outlet in a domestic installation is tested for:
- (i) correctness of polarity;
- (ii) effectiveness of earthing. (6 marks)
5. (a) Explain the application of each of the following tools when used in electrical installation practice.
- (i) long nose pliers.
- (ii) ball-pein hammer.
- (ii) hand drill. (6 marks)
- (b) With aid of labelled diagrams, outline the procedure of making a Britannia joint using two pieces of vulcanized rubber - insulated cable. (8 marks)
- (c) (i) Explain why double wound transformers are used in bell circuits.
- (ii) Draw a wiring diagram showing how two d.c. electric bells are operated independently by two bell - pushes. (6 marks)

SECTION B: SOLAR INSTALLATION (40 marks)

Answer any TWO questions from this section.

6. (a) Distinguish between the following terms as used in solar technology:
- (i) photo voltaic module;
 - (ii) array. (3 marks)
- (b) Explain:
- (i) **three** applications of photovoltaic solar system;
 - (ii) the need for a solar charge controller. (10 marks)
- (c) Outline the steps involved in estimating the daily energy load demand for a solar home system. (7 marks)
7. (a) State:
- (i) **three** factors to be considered when carrying out wiring of a solar installation;
 - (ii) **two** reasons for correct sizing of cables. (5 marks)
- (b) (i) List **four** factors that determine the amount of voltage drops in a cable.
- (ii) A 2.5 mm² cable connected between a solar module and batteries carries a current of 4 A. If the module and batteries are positioned 10 m apart determine the voltage drop in the cable.
(Take resistivity of conductor as 0.0183 Ω - mm) (8 marks)
- (c) Explain **two** apparatus used in cable size calculations. (4 marks)
- (d) State **three** factors to be considered when locating a solar battery during installation. (3 marks)
8. (a) Define the following terms when used in solar batteries:
- (i) depth of discharge;
 - (ii) autonomy. (4 marks)
- (b) The daily energy demand for a home solar system consumer is 16.7 Ampere Hours. The number of days of autonomy is 5. If the allowable depth of discharge is 0.5, determine the battery capacity. (3 marks)

(c) Outline the first - aid treatment for each of the following accidents involving battery acid.

(i) skin contact;

(ii) eye contact;

(ii) swallowing of acid.

(6 marks)

(d) Draw a labelled block diagram of a PV - solar system used to operate a 240 VAC television set.

(7 marks)
