

2601/105 2603/105

2602/105

ELECTRICAL AND SOLAR  
INSTALLATION TECHNOLOGY

June/July 2016

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING  
(POWER OPTION)  
(TELECOMMUNICATION OPTION)  
(INSTRUMENTATION OPTION)  
MODULE I

ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY

3 hours

**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*A non-programmable electronic calculator;*

*Drawing instruments;*

*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 as shown.*

*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) Explain the following cable jointing methods:
  - (i) pot and ladle;
  - (ii) clamping. (4 marks)
- (b) State **three** IEE regulations requirement regarding joints and terminations. (3 marks)
- (c) Outline the procedure for carrying out polarity test with circuit alive on a single phase installation. (7 marks)
- (d) State **three**:
  - (i) factors that affect the choice of a wiring system;
  - (ii) advantages of trunking system over conduit system. (6 marks)
2. (a) (i) State **two** reasons of earthing an electrical installation.  
(ii) Define the following in relation to earthing and protection:
  - (I) earth lead;
  - (II) cartridge fuse;
  - (III) circuit protective conductor. (5 marks)
- (b) With aid of a labelled diagram, explain the following methods of earthing an electrical installation:
  - (i) direct earthing;
  - (ii) protective multiple earthing. (6 marks)
- (c) (i) State **three** IEE regulations requirement regarding bell-transformers.  
(ii) With aid of a circuit diagram, explain the working principle of a "closed circuit" burglar alarm having one sensing point. (9 marks)
3. (a) Explain the following with reference to safety:
  - (i) electric shock;
  - (ii) protective clothing. (4 marks)

- (b) Describe the Holger Nelson Method carried out on an electric shock victim. (6 marks)
- (c) (i) Explain how each of the following can cause accidents:  
 I. using defective tools;  
 II. improvising tools.
- (ii) List three types of tools and their application in the field of electrical and electronics. (10 marks)
4. (a) State three sources of energy used in Kenya for power generation. (3 marks)
- (b) Draw a labelled diagram of a typical supply system from generating station to consumer terminals. (9 marks)
- (c) (i) Using a block diagram, show the sequence of control at the consumer's intake point;
- (ii) State three HSE regulations requirement regarding final circuits. (8 marks)
5. (a) (i) State the quantity measured by the following instruments:  
 (I) Ohmmeter;  
 (II) Wattmeter.
- (ii) With aid of circuit diagrams, show the two ways an ammeter and voltmeter are connected to measure power of a circuit feeding a single phase load. (8 marks)
- (b) Write in full the meaning of the following abbreviation of different cables:  
 (i) PVC SWA;  
 (ii) MIMs;  
 (iii) PILCSWA. (3 marks)
- (c) (i) Explain how the following factors affect cable rating:  
 (I) ambient temperature;  
 (II) type of protective device.
- (ii) A 10.5 kW cooker is connected to 250V supply. The ambient temperature correction factor is 0.89. If the protective device used is a re-wirable fuse with a correction factor of 0.725, determine the current rating of the cable to be used. (9 marks)

## SECTION B: SOLAR INSTALLATION

*Answer any TWO questions from this section.*

6. (a) (i) With aid of circuit diagrams show how three solar batteries are connected in:
- (I) parallel;
  - (II) series.
- (ii) State the quantity enhanced in each connection in (a) (i). (10 marks)
- (b) List the sizing conditions for the following components:
- (i) inverter;
  - (ii) solar charge controller. (6 marks)
- (c) Outline the maintenance carried out on the following:
- (i) lights and switches;
  - (ii) PV module. (4 marks)
7. (a) Draw a labelled block diagram of an a.c./d.c. PV solar system. (5 marks)
- (b) Explain the function of the following accessories used in solar system installation:
- (i) socket outlets;
  - (ii) ceiling roses;
  - (iii) consumer control unit. (6 marks)
- (c) With aid of a labelled diagram explain the operation of a solar cell. (9 marks)
8. (a) (i) State the basic energy resource for all types of solar systems.
- (ii) Define the following angles with respect to available energy reaching the earth's surface:
- (I) angle of incidence;
  - (II) altitude angle. (3 marks)

- (b) (i) Explain the purpose of a solar collector.  
(ii) List five types of solar collectors used in solar systems.

(7 marks)

- (c) Explain how solar energy is used in the following areas:

- (i) crop drying;
- (ii) cooking;
- (iii) water heating;
- (iv) space heating;
- (v) green houses.

(10 marks)

**THIS IS THE LAST PRINTED PAGE.**