

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 IEE 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, determin 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)

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