2601/105 2603/105
2602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./Nov. 2017
Time: 3 hours

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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

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INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
A non-programmable electronic calculator;
Drawing instruments.
*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **THREE** questions from section **A** and **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.

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SECTION A

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

1. (a) Explain:

   (i) The term wiring system.

   (ii) **Two** factors taken into consideration when selecting a particular wiring system. (6 marks)

   (b) List **two** types of wiring accessories and for each case, state its function. (4 marks)

   (c) (i) Explain the importance of safety regulations in electrical workshops.

   (ii) Outline **four** safety measures employed in electrical workshops to minimize accidents. (6 marks)

   (d) Explain **four** first aid procedures when rescuing a person in contact with a live wire at a construction site. (4 marks)

2. (a) Name **two** electrical tools and for each case state its function. (4 marks)

   (b) State **three**:

   (i) advantages of a hydro station over nuclear power station;

   (ii) factors considered when siting a hydro power station. (6 marks)

   (c) Draw labelled diagrams for each of the following power distribution systems:

   (i) d.c. two-wire;

   (ii) a.c. three phase 4-wire;

   (iii) a.c. two wire. (7 marks)

   (d) Outline **three** types of topologies of structured cables. (3 marks)

3. State **three**:

   (i) Classifications of analog instruments.

   (ii) Advantages of permanent magnet moving coil instruments over moving iron. (6 marks)

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(b) A moving coil instrument has an element of resistance of 10 Ω and gives full-scale deflection with a potential difference of 100 mV. Determine the value of resistance to be placed in series with the element to give full scale deflection when connected across a potential difference of 120 V d.c. (8 marks)

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(c) (i) Draw **six** socket outlets connected in ring. Include a spur.

(ii) State **three** IEE regulations requirement in (c) (i). (6 marks)

4. (a) Explain reasons for earthing electrical installations. (2 marks)

(b) (i) Outline **four** methods used to achieve the earthing of an installation.

(ii) List **six** types of earth electrodes. (7 marks)

(c) With the aid of a labelled diagram, explain the operation of a single phase current operated earth leakage circuit - breaker. (8 marks)

(d) State **three** requirements of a good electrical protection system. (3 marks)

5. (a) (i) Explain the term 'fire alarm system'.

(ii) Draw a labelled schematic diagram of a closed circuit alarm system. (6 marks)

(b) Outline **four** tasks involved in maintaining batteries and give a reason for each. (8 marks)

(c) With aid of a circuit diagrams describe how earth electrode resistance test is carried out on a completed installation. (6 marks)

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SECTION B

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

6. (a) (i) Name **four** applications of solar energy.

(ii) State **two** advantages of solar electricity over other sources of electricity. (4 marks)

(b) Explain how a solar cell works. (5 marks)

(c) (i) Draw a labelled P.V. solar module I - V curve.

(ii) Explain **three** points on the curve in (c) (i). (9 marks)

(d) Outline **four** methods of solar harvesting. (2 marks)

7. (a) List **four** features considered when selecting a P.V. solar module for a domestic installation. (4 marks)

(b) Outline the **five** parts of a solar electric system and explain the function of each. (10 marks)

(c) Table 1 shows trouble shooting results obtained from a solar installation. Complete the table.

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Table 1

Problem	Three possible causes
Battery state of charge is low	
No output power from the solar module	

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8. (a) Explain the following with respect to solar systems.

(i) insolation;

(ii) solar incident angle. (4 marks)

(b) (i) Table 2 shows energy consumption in a 12 V domestic solar installation. Determine the total daily system energy requirement if energy losses total to 15%.

Table 2

Lamp/Appliance	Voltage Rating	Power Rating	Daily use hours
Fluorescent lamp	12	14 W	4
Colour TV	12	80 W	3
Lamps	12	10	8

(ii) List **four** useful tools used when carrying out maintenance of solar electric system. (11 marks)

(c) A globe lamp is connected to a 12 volt battery. When it is turned on, 5 amperes of current flows through the wire. Determine the power of the lamp. (3 marks)

(d) Outline **four** types of cable joints used in solar installations. (2 marks)

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