2601/105 2603/105
2602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./Nov. 2018
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ELECTRICAL AND ELECTRONIC 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:
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 6 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

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

1. (a) Explain **three** reasons for earthing an electrical installation. (6 marks)

   (b) Outline **four** methods used to achieve earthing. (4 marks)

   (c) Define the following terms as used in electrical protection:

   (i) current rating;

   (ii) discrimination. (4 marks)

   (d) Draw a labelled diagram of cartridge fuse. (6 marks)

2. (a) (i) State **four** causes of accidents in the workshop.

   (ii) Outline the procedure to be followed incase of a fire outbreak. (8 marks)

   (b) Explain the function of each of the following workshop tools and state how they are stored:

   (i) hacksaw;

   (ii) soldering bit;

   (iii) centre punch. (6 marks)

   (c) Explain the following methods of battery charging:

   (i) trickle charging;

   (ii) constant current. (4 marks)

   (d) A battery whose terminal voltage is 12 V d.c and internal resistance 0.25 Ω is charged from a 14 V d.c supply.
   Calculate the charging current. (2 marks)

3. (a) (i) List **four** types of electric bells.

(ii) Outline **three** IEE regulation requirements regarding bell transformers.

(5 marks)

(b) Draw the following electrical bell indicator types:

(i) pendulum type;

(ii) mechanical replacement.

(6 marks)

(c) Explain why the following installation tests are carried out and for each case state the measuring instrument used:

(i) continuity test.

(ii) earthing test. (4 marks)

(d) Illustrate the measurement of power, current and voltage in the same circuit.

(5 marks)

4. (a) State **three** IEE regulation requirements regarding:

(i) switch gears;

(ii) 13A socket outlets.

(6 marks)

(b) Draw a **three** heat switch showing the following positions:

(i) low;

(ii) medium. (6 marks)

(c) (i) Outline **three** factors to be considered when selecting the site for a diesel power station;

(ii) Draw a labelled block diagram of a diesel power station.

(8 marks)

5. (a) (i) State **two** IEE regulation requirements regarding cable joints and terminations.

(ii) Define the term soldering. (4 marks)

(b) Sketch the following cable joints and for each case state **one** application:

(i) Britannia joint;

(ii) Belhanger's joint. (6 marks)

(c) (i) Outline **four** precautions to be observed when installing catenary wiring system.

(ii) Describe the earth concentric wiring system. (6 marks)

(d) Draw a labelled diagram showing a vertical bus-bar rising main system. (4 marks)

SECTION B

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

6. (a) (i) Explain the function of a solar collector.

(ii) Name **three** types of solar energy collectors.

(5 marks)

(b) With aid of a labelled diagram explain the operation of solar concentrating type cookers. (5 marks)

(c) Outline **two** advantages and **two** disadvantages of using solar electricity. (4 marks)

(d) With aid of a labelled diagram explain the operation of a solar cell. (6 marks)

7. (a) Describe the following as used in a solar installation:

(i) consumer unit;
(ii) ceiling roses.

(4 marks)

(b) Draw the wiring diagram of a photo-voltaic (P.V) solar installation control gear/equipment in the correct sequence.

(6 marks)

(c) Explain **two** benefits of solar electric energy in the remote areas. (4 marks)

(d) A solar module is rated 40 wp, current 3.2 A and output voltage of 17.6 V. Draw the connections and show the outputs if two of such modules are connected in:

(i) series;

(ii) parallel.

(6 marks)

8. (a) Outline the service and maintenance done on a photo-voltaic (P.V) solar module.

(4 marks)

(b) (i) Explain **three** ways a solar battery needs service.

(ii) Outline the safety precautions when handling lead-acid batteries.

(9 marks)

(c) Explain each of the following factors when sizing and designing a P.V solar installation:

(i) insolation;

(ii) system losses.

(4 marks)

(d) A 12 V d.c P.V solar home system whose total daily energy demand is 1200 wh. Assuming that the system losses are 20%, determine:

(i) total daily system requirements;

(ii) battery capacity in ampere hours.

(3 marks)

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