

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. (8 marks)
- (ii) Outline the procedure to be followed in case 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 0.25Ω 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)

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SECTION B

Answer **TWO** questions from this section.

6. (a) (i) Explain the function of a solar collector. (5 marks)
- (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: (4 marks)
- (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: (6 marks)
- (i) series;
- (ii) parallel.

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; (4 marks)
(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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