2601/105 2603/105
2602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
June/July 2019
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 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.

Turn over

SECTION A: ELECTRICAL INSTALLATION

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

1. (a) State **three**:

(i) Reasons for the I.E.E. regulations in electrical installations.

(ii) Safety precautions when working on live electrical circuits.

(6 marks)

(b) (i) Explain **three** conditions under which combustion takes place.

(ii) Table 1 shows types of fire extinguishers colour and type of fire. Complete the table. (6 marks)

Table 1

Extinguisher	Colour	Type of fire
Carbon dioxide		
Dry powder water		

(c) Explain **two** safety precautions to be observed when using each of the following engineering tools:

(i) screwdrivers;

(ii) files.

(4 marks)

(d) (i) Draw a circuit diagram of one lamp controlled by one switch and show how insulation resistance test is carried out on the circuit.

(ii) Name the instrument used and the reading obtained in d (i).

(4 marks)

2. (a) Distinguish between the following types of cables:

(i) P.V.C.;

(ii) T.R.S.

(4 marks)

(b) With aid of a labelled diagram describe the construction of a mineral insulated metal sheathed cable. (6 marks)

(c) (i) Outline **four** advantages of trunking over conduit wiring system.

(ii) Explain the catenary wiring system.

(7 marks)

(d) List **six** conduit fittings that are used in installation of the conduit. (3 marks)

3. (a) (i) Name **three** constituents of a gas electric power plant.

(ii) Outline **three** advantages of a steam electric power station.

(6 marks)

(b) Explain the function of a surge tank in a hydro-power station. (3 marks)

(c) (i) Draw a line diagram showing the sequence of control at the consumers intake point.

(ii) List **two** final circuits and indicate their fuse ratings and cable sizes.

(7 marks)

(d) Explain the **two** insulation resistance tests carried out in an electrical installation.

(4 marks)

4. (a) State **three**:

(i) indications of a fully charged lead acid cell.

(ii) methods of charging batteries.

(6 marks)

(b) (i) Describe a fire alarm system.

(ii) Draw a labelled circuit diagram of a closed alarm circuit with reset circuit.

(7 marks)

(c) Distinguish between an ammeter and a voltmeter when connected in a circuit.

(4 marks)

(d) Draw a labelled circuit diagram of a Wattmeter. (3 marks)

5. (a) Describe the following parts of an earthing system:

(i) earth electrode;
(ii) earth lead.

(4 marks)

(b) Draw a labelled diagram of current operated earth leakage circuit breaker. (8 marks)

(c) Distinguish between a class P fuse and a class R fuse. (4 marks)

(d) (i) Define structured cabling;

(ii) Describe the entrance facilities of a structured cabling.

(4 marks)

SECTION B: SOLAR INSTALLATION

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

6. (a) List **four** types of:

(i) cable joints;
(ii) wiring systems.

(4 marks)

(b) Explain the function of each of the following accessories as used in solar electric installations:

(i) switches;
(ii) lamps.

(4 marks)

(c) (i) Draw a labelled diagram showing the earthing of the P.V. solar module.

(ii) State **two** reasons for earthing the module in c (i).

(8 marks)

(d) State **four** tests carried out on a completed solar electric installation. (4 marks)

7. (a) (i) State **two** conversions of solar energy.

(ii) Explain how a parabolic dish mirror maximizes harvesting of solar energy.
(4 marks)

(b) With aid of a labelled diagram describe the constructional features of a flat plate collector. (6 marks)

(c) Draw the connections and show the total output of two 12 V identical batteries rated 50 Ah connected in:

(i) parallel;
(ii) series.
(10 marks)

8. (a) (i) Outline the inspection and checks carried out on the wiring and control gear of a solar installation.

(ii) List **three** documents or information that can be availed and referred to during service and maintenance of a solar electric system.
(9 marks)

(b) Describe the following conditions that affect a lead acid battery:

(i) stratification;
(ii) sulphation.
(4 marks)

(c) Explain the following terms used when sizing solar electrical installation:

(i) total daily system energy requirement;

(ii) days of autonomy.
(4 marks)

(d) A solar module rated 150 W receives daily insulation of 7 hours/day. The system losses are 20%. Determine the output of the module per day.
(3 marks)

THIS IS THE LAST PRINTED PAGE.