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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.

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. (7 marks)
- (ii) Explain the catenary wiring system. (3 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. (6 marks)
- (ii) Outline **three** advantages of a steam electric power station. (3 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. (7 marks)
- (ii) List **two** final circuits and indicate their fuse ratings and cable sizes. (4 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. (6 marks)
- (ii) methods of charging batteries. (6 marks)
- (b) (i) Describe a fire alarm system. (7 marks)
- (ii) Draw a labelled circuit diagram of a closed alarm circuit with reset circuit. (4 marks)
- (c) Distinguish between an ammeter and a voltmeter when connected in a circuit. (3 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 insolation of 7 hours/day. The system losses are 20%. Determine the output of the module per day. (3 marks)

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