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**ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY**

June/July 2017

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:

Electronic calculator;

Drawing instruments;

Answer booklet.

This paper consists of TWO sections; A and B.

Answer any FIVE questions as follows: THREE questions from section A and any TWO questions from section B.

All questions carry equal marks.

Candidates should answer the questions in English.

This paper consists of 4 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) Explain **three** advantages of using a.c. over d.c. power supply system. (6 marks)
- (b) Draw a labelled layout of ring distribution diagram of a power supply system. (8 marks)
- (c) State **three**:
- (i) advantages of hydro-electric power station;
 - (ii) disadvantages of a diesel power station.
- (6 marks)
2. (a) State:
- (i) **one** requirement of an electric cable;
 - (ii) **four** types of flexible electric cables.
- (5 marks)
- (b) (i) Outline **three** rating factors that affect current rating of cables.
(ii) A 2 - core copper cable supplies current to a 240 V single phase load of 20 kW at 0.8 power factor lagging. The cable is 52 metres long and each conductor has a cross-sectional area of 35 mm^2 . Determine the voltage drop in the cable. Take resistivity of copper as $17.5 \mu\Omega \text{ mm}$.
- (9 marks)
- (c) With the aid of a diagram describe the procedure of making a britannia joint. (6 marks)
3. (a) (i) Define the term 'wiring system'.
(ii) Explain **two** factors considered when selecting a particular wiring system. (6 marks)
- (b) With the aid of a diagram, describe overhead trunking wiring system. (4 marks)
- (c) (i) State **two** types of measuring instruments kept in an electrical workshop.
(ii) With the aid of circuit and phaser diagrams derive the expression for total power measured using the two wattmeter method. (10 marks)

4. (a) (i) Name **three** types of earth electrodes.
(ii) Explain the term 'direct earthing'. (5 marks)
- (b) With the aid of a diagram, describe protective multiple earthing. (7 marks)
- (c) Draw circuit diagram showing how two lamps are wired using:
(i) four - plate ceiling rose;
(ii) loop-in method at switch position. (4 marks)
- (d) Outline **two** causes of accidents in installation workshops. (4 marks)
5. (a) (i) With the aid of a diagram, explain constant current charging of a lead-acid battery.
(ii) List **four** maintenance procedures observed in keeping the battery in (a)(i) in good condition. (8 marks)
- (b) State **four** types of network topologies. (4 marks)
- (c) With the aid of a diagram, describe ring circuit continuity test for four socket outlets. (6 marks)
- (d) Outline **one** application of the following tools:
(i) hacksaw;
(ii) screwdriver. (2 marks)

SECTION B: SOLAR INSTALLATION

Answer TWO questions from this section.

6. (a) Define the following terms as used in solar PV systems:
(i) solar cell;
(ii) irradiance. (4 marks)
- (b) With the aid of a block diagram, describe the component parts of a solar PV system. (10 marks)
- (c) Outline:
(i) **four** factors which affect the power output from a solar cell module;
(ii) **two** types of solar energy harvesting devices. (6 marks)

7. (a) List **four** situations which favour the use of solar power installation. (4 marks)
- (b) Explain **four** factors taken into consideration when mounting solar modules. (8 marks)
- (c) State the application of the following in the maintenance of solar electric systems:
- (i) voltmeter;
 - (ii) distilled water;
 - (iii) baking soda;
 - (iv) hydrometer. (4 marks)
- (d) Outline **four** applications of solar electricity in Kenya. (4 marks)
8. (a) State **four** precautions observed when connecting wires in a solar installation. (4 marks)
- (b) (i) Define the term 'peak power' as used in planning a solar system.
- (ii) Outline the steps followed when determining the total daily system energy demand of a solar system. (8 marks)
- (c) Determine the battery capacity of a system having a daily energy requirement of 360 watt hours. (3 marks)
- (d) In a solar installation a wire with a resistance of 0.4Ω connects a 36 watt stereo amplifier to a 12 V battery. Determine the voltage drop between the amplifier and the battery. (5 marks)

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