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1601/105

1602/105

**ELECTRICAL AND SOLAR INSTALLATION
TECHNOLOGY**

June/July 2012

Time: 3 hours

Candidate's Signature: _____

Date: _____



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN ELECTRICAL AND
ELECTRONICS ENGINEERING
(POWER OPTION)
(TELECOMMUNICATION OPTION)**

MODULE I

ELECTRICAL AND SOLAR INSTALLATION

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have scientific calculator/mathematics tables for this examinations.

*This paper has **TWO** sections, **A** and **B**.*

*Answer any **THREE** questions from section **A**.*

*Answer any **TWO** questions from section **B**.*

Answer all questions in the space provided in this question paper.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
Total Score			

This paper consists of 16 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 any **THREE** questions from this section.

1. (a) State **three** regulations regarding switchgears at the consumer's intake point. (3 marks)
- (b) Draw circuit diagrams of the following systems of distribution:
 - (i) A.C three-wire single phase;
 - (ii) D.C three-wire.(10 marks)
- (c) Draw a labelled line diagram of a typical national grid system in Kenya and indicate standard voltages at each level. (7 marks)
2. (a) State **three** methods for protecting an installation against earth leakage currents. (3 marks)
- (b) Define the following terms as used in fuses:
 - (i) current rating;
 - (ii) fusing current;
 - (iii) discrimination(6 marks)
- (c) With the aid of a labelled circuit diagram, describe the operation of a current operated earth leakage circuit breaker. (11 marks)
3. (a) State any:
 - (i) **three** voltage classifications of consumer units;
 - (ii) **two** groups of final circuits.(5 marks)
- (b) A domestic cooker is connected to a 230V supply and its load is 8.5kw. Determine the rating of the circuit. (6 marks)
- (c) (i) Outline the procedure for selecting a cable for a particular application.
- (ii) Explain how the following factors affect the rating of conductors:
 - (I) Diversity;
 - (II) Type of excess current protection;
 - (III) Thermal insulation.(9 marks)

4. (a) Explain the significance of carrying out the following tests on a completed electrical installation:
- (i) polarity,
 - (ii) earth electrode resistance.
- (4 marks)
- (b) Draw a labelled diagram of a consumer unit having a final circuit of a ring circuit with three socket outlets and a spur. Indicate the cable size and fuse rating.
- (9 marks)
- (c) With aid of a circuit diagram, describe the loop-in method in wiring a lighting circuit.
- (7 marks)
5. (a) Describe with the aid of a labelled diagram the constructional features of a d.c. machine.
- (12 marks)
- (b) Draw labelled circuit diagrams of the following electrical machines:
- (i) Capacitor start, induction motor,
 - (ii) Compound wound motors.
- (8 marks)

SECTION B:

Answer any TWO questions from this section.

6. (a) Differentiate between photovoltaic effect and photo electric effect with regards to solar installation systems.
- (4 marks)
- (b) (i) With the aid of a labelled diagram, explain the working principle of a solar cell.
- (6 marks)
- (ii) Explain with aid of a labelled block diagram function of each component part of a photovoltaic system.
- (10 marks)
7. (a) State **two**;
- (i) disadvantages of solar cookers;
 - (ii) advantages of using solar water heaters.
- (4 marks)
- (b) Describe with the aid of a labelled diagram the construction of liquid flat plate collector.
- (10 marks)
- (c) Describe the following methods of pumping water using solar energy:
- (i) Direct conversion scheme;
 - (ii) Thermodynamic conversion.

8. (a) Define the following terms as applied in solar installation:
- (i) Radiation;
 - (ii) Insulation.
- (4 marks)
- (b) State any **two**:
- (i) Methods of solar energy harvesting
 - (ii) Applications of solar energy.
- (4 marks)
- (c) State **one** possible cause and remedy for the following solar installation:
- (i) Battery state is low;
 - (ii) No solar charge.
- (8 marks)
- (d) Draw a labelled schematic diagram of a solar water heater.
- (4 marks)