

Name: \_\_\_\_\_ Index No. \_\_\_\_\_

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Candidate's Signature: \_\_\_\_\_

**ELECTRICAL AND SOLAR INSTALLATION  
TECHNOLOGY**

June/July 2015

Time: 3 hours

Date: \_\_\_\_\_

**THE KENYA NATIONAL EXAMINATIONS COUNCIL****DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING  
(POWER OPTION)****(TELECOMMUNICATION OPTION)****(INSTRUMENTATION OPTION)****MODULE I****ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY****3 hours****INSTRUCTIONS TO THE CANDIDATE***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 an electronic calculator and drawing instruments for this examination.**This paper consists of **TWO** sections **A** and **B**. Answer **FIVE** questions as follows:**Answer any **THREE** questions from section **A** and any **TWO** questions from section **B** in the spaces provided in this question paper.**All questions carry equal marks.**Do **NOT** remove any pages from this booklet.**Candidates should answer the questions in English.***For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
<b>A</b>		20	
		20	
		20	
<b>B</b>		20	
		20	
<b>Total Score</b>			

**This paper consists of 20 printed pages.****Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

2015

## SECTION A

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

1. (a) State **three**:
  - (i) advantages of the grid system;
  - (ii) authorities involved in power production.

(6 marks)
- (b) With aid of a labelled diagram, explain how a hydroelectric power station operates.
 

(8 marks)
- (c) Draw labelled circuits diagrams of power distributions systems.
  - (i) D.C three wire;
  - (ii) A.C two phase three wire.

(6 marks)
2. (a) (i) Complete the following cable abbreviations and state an application for each.
  - (I) P.C.P
  - (II) MIMS

(8 marks)
- (ii) Outline the procedure for making a married joint.
 

(8 marks)
- (b) (i) Describe the 'vertical rising mains' trunking wiring system.
 

(9 marks)
- (ii) Outline the procedure of laying an underground cable.
 

(3 marks)
- (c) Explain the 'horizontal cabling' system structure.
 

(3 marks)
3. (a) (i) Define 'fire alarm system'.
 

(6 marks)
- (ii) Explain the purpose of a fire alarm system.
 

(6 marks)
- (b) (i) With aid of a circuit diagram, explain the operation of a closed intruder alarm system;
 

(10 marks)
- (ii) State **three** advantages of the system in (b)(i).
 

(4 marks)
- (c) Draw a labelled diagram of a trembler bell.
 

(4 marks)



4. (a) Name **two** electrical measuring instruments and state the quantity they measure. (2 marks)
- (b) Draw a labelled diagram of a 6-way consumer unit and indicate the ratings and cable sizes of each of the following final circuits.
- (i) lighting circuit;
  - (ii) ring circuit;
  - (iii) water heater;
  - (iv) cooker circuit.
- (8 marks)
- (c) With aid of a circuit diagram describe the procedure for carrying out polarity test on a dead circuit. (6 marks)
- (d) Distinguish between a simmerstat and a thermostat. (4 marks)
5. (a) Define the following terms as used in electrical circuit protection:
- (i) fusing factor; —
  - (ii) fusing current. —
- (2 marks)
- (b) (i) State **four** advantages of circuit breakers over fuses.
- (ii) Draw a labelled diagram of a high breaking capacity fuse. (9 marks)
- (c) With aid of a labelled diagram, show how an earth loop impedance test is carried out. (9 marks)



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## SECTION B: MATERIALS

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

6. (a) Define the following solar energy terminologies:
- (i) radiation;
  - (ii) solar constant. (4 marks)
- (b) Explain the following solar energy harvesting devices and state one application of each:
- (i) simple reflector;
  - (ii) parabolic dishes. (6 marks)
- (c) Explain the reason for tracking and tilting of solar devices. (3 marks)
- (d) With the aid of a labelled diagram, describe the constructional and working principle of flat plate collector in solar water heating. (7 marks)
7. (a) Define the following in relation to solar installation:
- (i) array;
  - (ii) appliance. (2 marks)
- (b) (i) State **two** factors that determine the output of a solar cell.
- (ii) Distinguish between monocrystalline and polycrystalline solar cells. (8 marks)
- (c) Explain the:
- (i) low voltage disconnect in a charge controller;
  - (ii) difference between a voltage converter and an voltage inverter. (10 marks)



8. (a) State **two**:

(i) tests carried out in a solar installation;

(ii) precautions when handling lead-acid batteries.

(4 marks)

(b) Describe **two** methods of measuring the state of charge of a battery.

(4 marks)

(c) Table 1 represents a troubleshooting guide for solar installation.

Complete the table to indicate the possible causes and remedies for each problem.

(6 marks)

Table 1

	Problem	Cause(s)	Remedy(s)
(i)	Solar module has low or no power output		
(ii)	Battery gets easily discharged		
(iii)	No current is flowing to battery from the charge controller		

(d) Table 2 shows a 12V d.c. solar domestic system for lamps and appliances. The ratings and number of hours per day are as shown. Determine the:

(i) daily energy requirement for each lamp/appliance and fill the table;

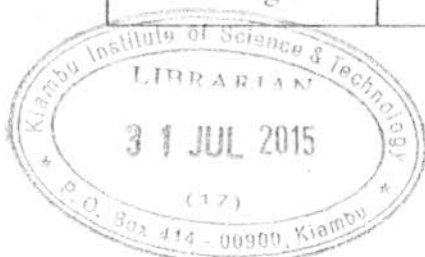
(ii) total daily energy requirement for the whole system;

(iii) system daily ampere hours, assuming no losses.

(6 marks)

Table 2

Lamp/appliance	Number	Rating (watts)	Number of hours of use/day (Hrs)	Daily energy requirement (watt hours)
Indoor lights	4	6	3	
Outdoor lights	1	8	1	
14" colour T.V	1	70	3	
Radio	1	10	3	
Phone charger	1	5	1	
Total				
Daily energy				
Requirement				



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