

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./Nov. 2018
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONIC TECHNOLOGY
(POWER OPTION)
(TELECOMMUNICATION OPTION)

MODULE I

ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Non-programmable Scientific calculator/Mathematical tables.

This paper consists of TWO sections; A and B.

Answer any THREE questions from section A and any TWO questions from section B.

Maximum marks for each part of a question are as indicated.

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to make ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: ELECTRICAL TECHNOLOGY

Answer **THREE** questions from this section.

1. (a) Define the following as used in protection of electrical installations:
 - (i) solidly earthed;
 - (ii) earth continuity conductor. (4 marks)
 - (b) Explain the following terms as used in protective devices:
 - (i) fusing factor;
 - (ii) current rating. (4 marks)
 - (c) Outline the fuse ratings and colour codes for a cartridge fuse. (6 marks)
 - (d) (i) Draw a labelled diagram showing a typical earth electrode pit.
(ii) Name two earth leakage protective devices. (6 marks)
2. (a) Outline the checks and inspections carried out when servicing and maintaining an electric motor. (6 marks)
 - (b) (i) List four parts of an a.c motor;
(ii) Draw a labelled circuit diagram of a universal motor. (6 marks)
 - (c) Distinguish using labelled circuit diagrams of a d.c shunt motor and a d.c shunt generator. (6 marks)
 - (d) Outline two tests carried out on an electric motor. (2 marks)
3. (a) (i) Explain the function of independent power producers in Kenya.
(ii) List two independent power producers in a (i). (4 marks)
 - (b) State two advantages of:
 - (i) a.c power over d.c systems;
 - (ii) hydro-electric power stations. (4 marks)
 - (c) Draw a block diagram of a hydro-electric power station. (6 marks)
 - (d) Draw a labelled diagram of a d.c 3-wire supply distribution system:- (6 marks)

4. (a) Explain the effect of each of the following electrical installations:
- (i) voltage drops;
 - (ii) ambient temperature. (4 marks)
- (b) Outline the procedure of terminating a flexible cable into a three pin plug. (6 marks)
- (c) Draw a labelled diagram of a tough rubber sheathed cable, (4 marks)
- (d) Make **three** comparisons between a tough rubber sheathed cable and a polyvinyl chloride cable. (6 marks)
5. (a) List **two** consumer equipment and **two** Kenya Power Company equipment at the consumer's intake point. (4 marks)
- (b) Draw a labelled diagram of a bimetallic thermostat. (6 marks)
- (c) Outline **two** main reasons for carrying out insulation resistance test in electrical installation. (4 marks)
- (d) Illustrate how polarity test is carried out in a lighting circuit which is:
- (i) 'live';
 - (ii) 'dead'. (6 marks)

SECTION B: SOLAR INSTALLATION TECHNOLOGY

Answer TWO questions from this section.

6. (a) (i) State the purpose of sizing a solar electric installation.
- (ii) Explain 'total daily energy demand' as related to solar sizing. (4 marks)
- (b) Table 1 shows the list of lamps and appliances to be supplied by 12 d.c in a small home system. Determine the:
- (i) total daily energy demand;
 - (ii) daily system requirement;
 - (iii) daily system charge requirement in ampere hours.
- Assume system losses as 20%. (8 marks)

Table 1

LAMP/APPLIANCE	POWER	DAILY USE	DAILY DEMAND
Lamps - 2	8 W	3	
Radio - 1	10 W	3	
Phone charger - 1	6 W	2	
Total daily energy demand			

- (c) Explain **two** methods of measuring the state of charge in a lead acid battery. (4 marks)
- (d) State **four** possible causes of solar battery having a low state of charge when connected to a photo voltaic solar module. (4 marks)
7. (a) Name **two**:
- solar cell construction types;
 - methods of harvesting solar energy. (4 marks)
- (b) Distinguish between diffuse radiation and direct solar radiation. (2 marks)
- (c) Draw a labelled diagram of a direct solar drier. (8 marks)
- (d) (i) Outline **four** factors that determine the output of a solar electric module.
- (ii) Figure 1 shows two 50 Wp photo voltaic solar modules connected in series. Draw the current-voltage curve. (6 marks)



Fig. 1

8. (a) State **four**:
- factors that affect the choice of a solar wiring system;
 - tests carried out on the completed installation. (8 marks)
- (b) Draw a labelled diagram of a consumer unit of a solar installation comprising of two final circuits and for each case indicate the fuse rating and cable size: (6 marks)
- (c) Outline the function of each of the following solar system control gear:
- solar battery;
 - P.V. solar module;
 - charge controller. (6 marks)

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