

1601/105  
1602/105  
ELECTRICAL AND SOLAR  
INSTALLATION TECHNOLOGY  
June/July 2020  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONICS 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;*

*Drawing instruments;*

*Non-programmable scientific calculator.*

*This paper consists of EIGHT questions in TWO sections; A and B.*

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

*Maximum marks to each part of a question are as 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 TECHNOLOGY

Answer **THREE** questions from this section.

1. (a) (i) State **three** methods of soldering cable joints. (6 marks)  
(ii) State any **three** types of cable joints.
- (b) Explain each of the following terms as used in cable size calculations:  
(i) ambient temperature; (4 marks)  
(ii) voltage drop.
- (c) Outline **three** I.E.E regulations regarding cable runs. (3 marks)
- (d) (i) State **three** merits of mineral insulated metal sheathed cables.  
(ii) Draw a labelled diagram of a three core vulcanized rubber insulated cable. (7 marks)
2. (a) **Figure 1** shows a construction diagram of a 4 - pole D.C machine.

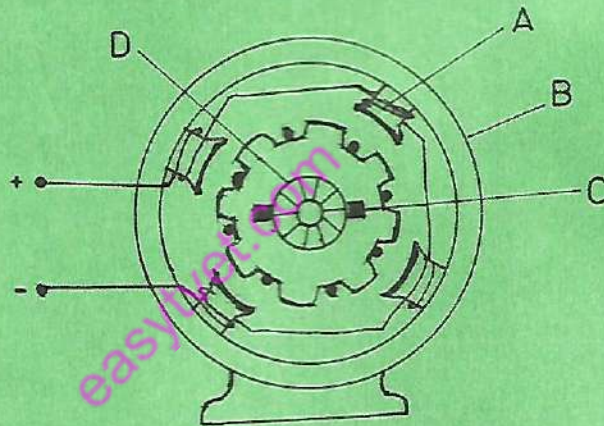


Fig. 1

- (i) Name the parts labelled A, B, C and D. (6 marks)  
(ii) State the function of part labelled C.
- (b) List **four** types of D.C motors. (4 marks)
- (c) (i) Draw a labelled circuit diagram of single phase A.C split phase induction motor. (7 marks)  
(ii) State the function of a centrifugal switch.
- (d) Outline **three** tests carried out in electrical machines. (3 marks)



3. (a) Explain the effects of each of the following faults in electrical installations:
- (i) sustained overloading of wiring and equipment;
  - (ii) faulty contacts and connections. (4 marks)
- (b) (i) State **three** advantages of MCBs over fuses .
- (ii) Draw a labelled diagram of a thermal trip of a circuit breaker. (6 marks)
- (c) State **four** I.E.E regulations requirements regarding P.M.E systems. (4 marks)
- (d) Draw and label a diagram of a voltage operated circuit breaker with relay operated trip. (6 marks)

4. (a) (i) Define a 'final circuit'.
- (ii) **Figure 2** shows a diagram of a consumer control unit.

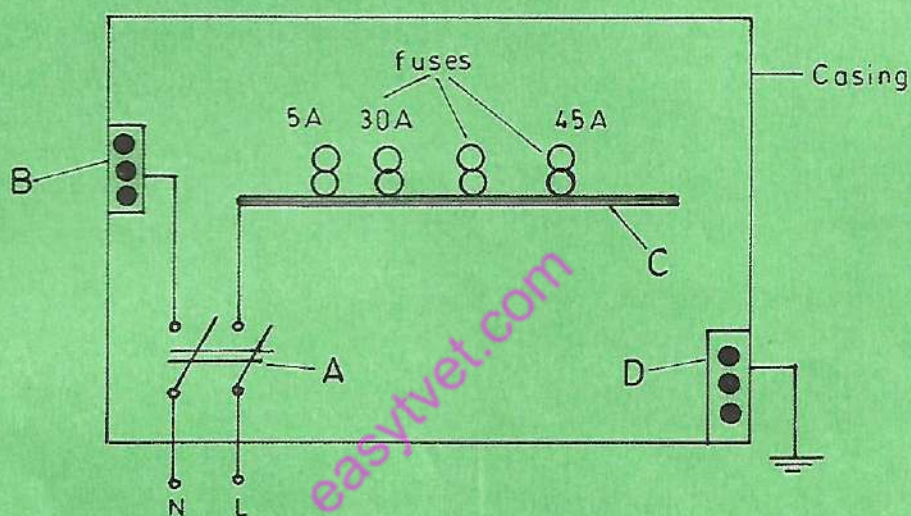


Fig.2

Name the parts labelled A, B, C and D. (6 marks)

- (b) Draw the wiring diagram of each of the following:
- (i) ring circuit with four socket outlets with one spur.
  - (ii) lighting circuit with three lighting points operated by one switch. (6 marks)
- (c) List in correct sequence the equipment at consumer's intake point. (4 marks)
- (d) Explain **four** reasons for carrying out the polarity test in electrical installation. (4 marks)

5. (a) (i) State **three** merits of hydro-electric generating plant.
- (ii) Explain the function of a water turbine in hydro-electric power plant. (5 marks)



- (b) Outline the stages of a typical power system from a generating station to the consumer and for each case state the voltage levels. (6 marks)
- (c) Draw a labelled diagram of a three-phase 4-wire system and indicate both single phase loads and three phase loads. (5 marks)
- (d) State **four** advantages of A.C over D.C system. (4 marks)

### SECTION B: SOLAR INSTALLATION TECHNOLOGY

Answer **TWO** questions from this section.

6. (a) Define each of the following as used in solar systems: (4 marks)
- irradiance;
  - diffuse radiation.
- (b) With the aid of a labelled diagram, explain the parabolic dish method of solar energy harvesting. (5 marks)
- (c) (i) Explain **two** methods of solar energy conversion. (5 marks)  
(ii) State **three** merits of direct solar drier. (6 marks)
- (d) Draw a labelled diagram of a solar box cooker. (4 marks)
7. (a) State **four** factors that affect the output of a solar module. (4 marks)
- (b) Explain the functions of each of the following solar system devices: (6 marks)
- DC - AC inverter;
  - charge controller;
  - solar battery.
- (c) (i) Describe **two** insulation resistance tests that are carried out in a completed solar installation. (4 marks)  
(ii) State any **two** factors that determine the choice of an electrical wiring system. (6 marks)
- (d) With aid of labelled circuit diagrams, show how four 12 V battery packs are connected in: (6 marks)
- parallel;
  - series.



8. (a) List **three** types of maintenance done on each of the following:

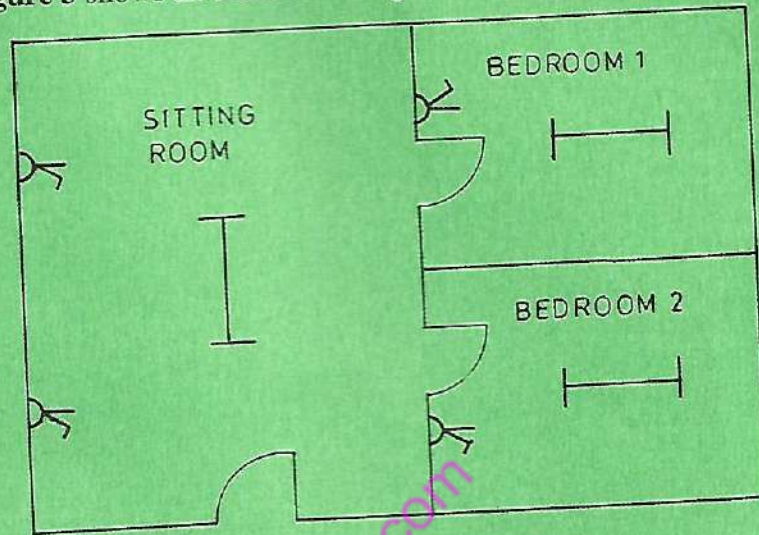
- (i) P.V module;
- (ii) solar battery.

(6 marks)

(b) State **three** possible causes and remedies for a solar battery when state of charge is low during a normal sunny day. (6 marks)

(c) (i) Outline **three** reasons for sizing a solar installation.

(ii) **Figure 3** shows an electrical design of a three roomed house using solar power.



KEY	
SYMBOL	DESCRIPTION
	Switch
	Lamp
	Socket

Fig. 3

The house will have the following:

- 8 W lamps which operates for 6 hours daily
- 6 W DVD player operating for 3 hours daily;
- 24 W solar TV operating for 4 hours daily.

Determine the total daily energy demand for the system.

(8 marks)

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