

1601/105
1602/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./Nov. 2022
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;

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 question from section B.

All questions carry equal marks.

Maximum marks for 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

Answer THREE questions from this section.

1. (a) Distinguish between earth continuity conductor and earth lead as used in electrical circuit protection. (4 marks)
 - (b) Explain:
 - (i) **three** reasons for earthing an electrical installation;
 - (ii) **two** parts of an electrical installation that must be earthed.(5 marks)
 - (c) Draw a labelled diagram of a current operated ELCB. (7 marks)
 - (d) Explain each of the following as used in protection:
 - (i) fuse;
 - (ii) fusing current.(4 marks)
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2. (a) (i) Describe 'final circuit'.
(ii) State three IEE regulation requirements regarding final circuits. (5 marks)
 - (b) Draw a labelled schematic line diagram showing the consumers supply intake point. (5 marks)
 - (c) **Figure 1** shows a layout of a single roomed house.

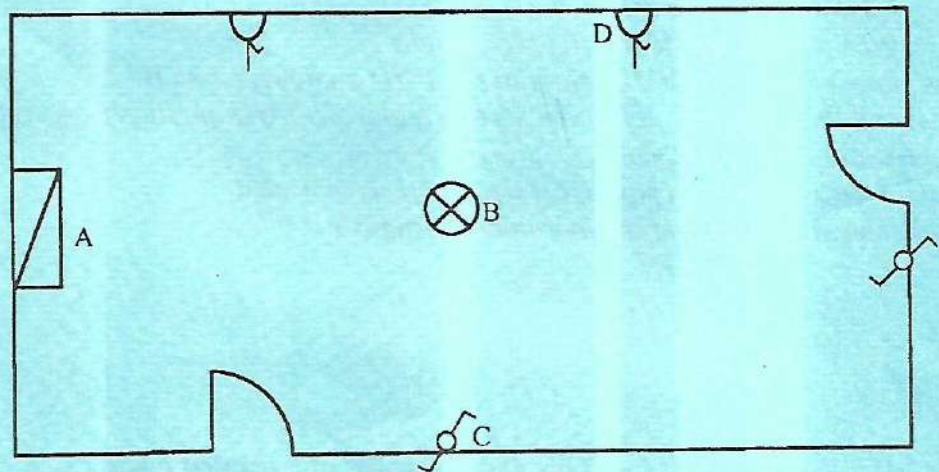


Fig. 1

- (i) Identify the electrical symbols labelled A, B, C and D;
(ii) Draw the wiring diagram of the layout;
(iii) State cable size and fuse rating for each circuit. (10 marks)
3. (a) List **four** construction parts of the armature of a D.C machine. (4 marks)
- (b) Draw schematic diagrams of each of the following D.C machines:
(i) shunt wound motors;
(ii) separately excited D.C generator. (6 marks)
- (c) Outline the procedure for dismantling an electric machine for repair and maintenance. (6 marks)
- (d) Draw a schematic diagram of a split phase induction motor. (4 marks)
4. (a) State any **four** merits of hydro-electric power station. (4 marks)
- (b) Explain the following factors considered when citing the location of a hydro-electric power station:
(i) availability of water;
(ii) cost and type of land. (4 marks)
- (c) List the standard voltages from generation to distribution points in Kenya. (4 marks)
- (d) (i) Draw a labelled schematic diagram of a D.C three wire distribution system.
(ii) State **four** electrical power authorities in Kenya. (8 marks)
5. (a) State any **two** types of:
(i) conductors;
(ii) insulators. (4 marks)
- (b) (i) Distinguish between a joint and a termination as used in electrical conductors.
(ii) State **two** requirements of a good electrical connection. (6 marks)

- (c) (i) State **four** factors that determine cable ratings.
(ii) The cable sheath of a cable is marked 7/2.14. Determine the size of cable. (5 marks)
- (d) Draw a labelled diagram of a paper insulated lead sheathed steel wire armoured cable. (5 marks)

SECTION B: SOLAR INSTALLATION TECHNOLOGY

Answer any TWO questions from this section.

6. (a) Name **two** types of:
- (i) accessories used in P.V solar installation;
(ii) wiring systems. (4 marks)
- (b) Explain each of the following factors used when determining the type of wiring system for P.V solar installation:
- (i) safety;
(ii) durability. (4 marks)
- (c) State:
- (i) **two** insulation resistance tests carried out on a P.V solar installation.
(ii) **three** electrical regulations governing solar installation. (7 marks)
- (d) Draw a labelled block diagram of a P.V solar installation to supply both D.C and A.C loads. (5 marks)
7. (a) State **two**:
- (i) forms of energy derived from the sun;
(ii) areas of applications of each type of energy in a(i). (6 marks)
- (b) List **four** factors that determine the solar heat energy absorbed on a surface. (4 marks)

- (c) Explain each of the following solar energy terminologies:
- (i) solar incident angle;
 - (ii) irradiance. (4 marks)
- (d) (i) Draw a labelled diagram of a parabolic dish.
(ii) State **two** disadvantages of the parabolic dish as employed for solar cookers. (6 marks)
8. (a) Outline the maintenance done on lighting circuits and switches in a P.V solar installation. (4 marks)
- (b) (i) State **four** safety precautions observed when dealing with solar lead acid batteries;
(ii) Illustrate the connection of four solar batteries and their affect on output when connected in:
(I) series;
(II) parallel. (6 marks)
- (c) Outline **three** factors considered when determining the size of each of the following solar devices:
(i) inverter;
(ii) battery. (6 marks)
- (d) A two bedroomed house requires the following for its P.V installation:
- four 8 W lamps used 4 hours daily;
- one 60 W coloured T.V used 3 hours per day;
- one 75 W refrigerator used 24 hours daily.
Determine the total daily load energy demand for the systems. (4 marks)

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