2601/105
2602/105
2603/105
ELECTRICAL AND SOLAR
INSTALLATION TECHNOLOGY
Oct./Nov. 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (POWER OPTION) (TELECOMMUNICATION OPTION) (INSTRUMENTATION 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 electronic calculator;
drawing instruments.
*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **THREE** questions from section **A** and **TWO** questions 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 7 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) State:

   (i) **three** reasons for carrying out the verification of polarity test;

   (ii) the instruments used and reading expected for the test in (a) (i). (5 marks)

   (b) Draw a circuit diagram showing how a voltmeter and ammeter are connected to obtain voltage and current readings. (3 marks)

   (c) (i) Draw and label a diagram of a closed-circuit burglar alarm system.

   (ii) State **two** demerits of the system in (c) (i). (6 marks)

   (d) (i) Outline **three** safety precautions observed in a battery charging room.

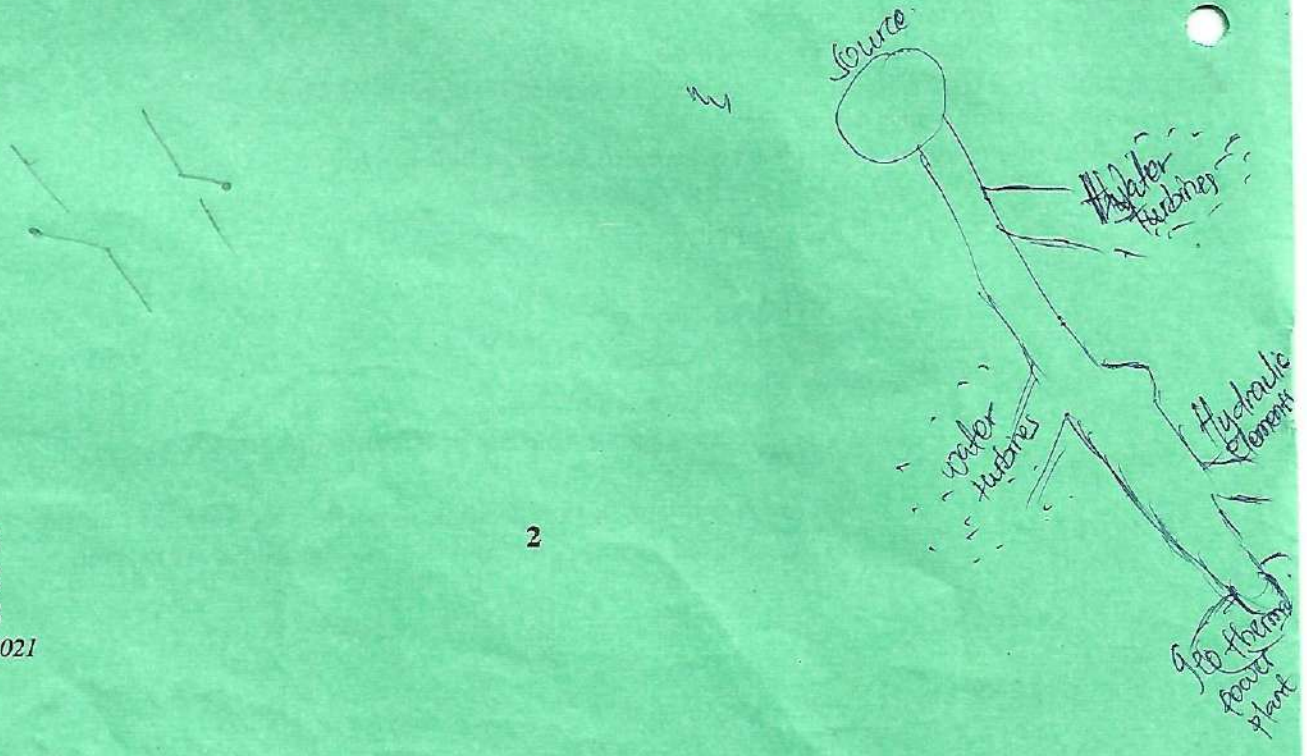
   (ii) State **three** methods of charging a battery. (6 marks)

2. (a) State **two** advantages and **two** disadvantages of a nuclear power plant. (4 marks)

   (b) Draw a labelled diagram of a Hydro-electric power plant. (6 marks)

   (c) (i) Outline **three** I.E.E regulation requirements of a consumers supply intake point.

   (ii) Distinguish between a ring and a radial final circuit in relation to wiring of socket outlets. (7 marks)



(d) Figure 1 shows the electrical layout of a house.

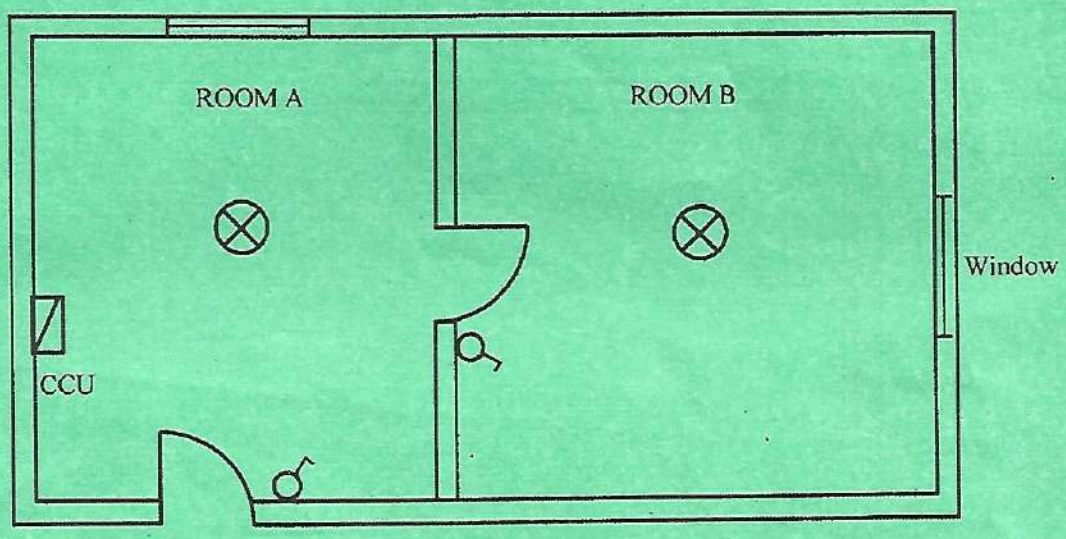


Fig. 1

Draw the wiring diagram for the lighting system using the loop-in-method such that each lamp is controlled independently. (3 marks)

3. (a) (i) Define 'ambient temperature'

(ii) Explain the effect of heat on the following materials;

(i) pure metals;

(ii) alloys;

(iii) carbon and electrolytes.

(4 marks)

(b) Explain the following methods of joining electrical conductors:

(i) soldering bit;

(ii) pot and laddle.

(6 marks)

(c) Figure 2 shows the layout of steel conduit installations:

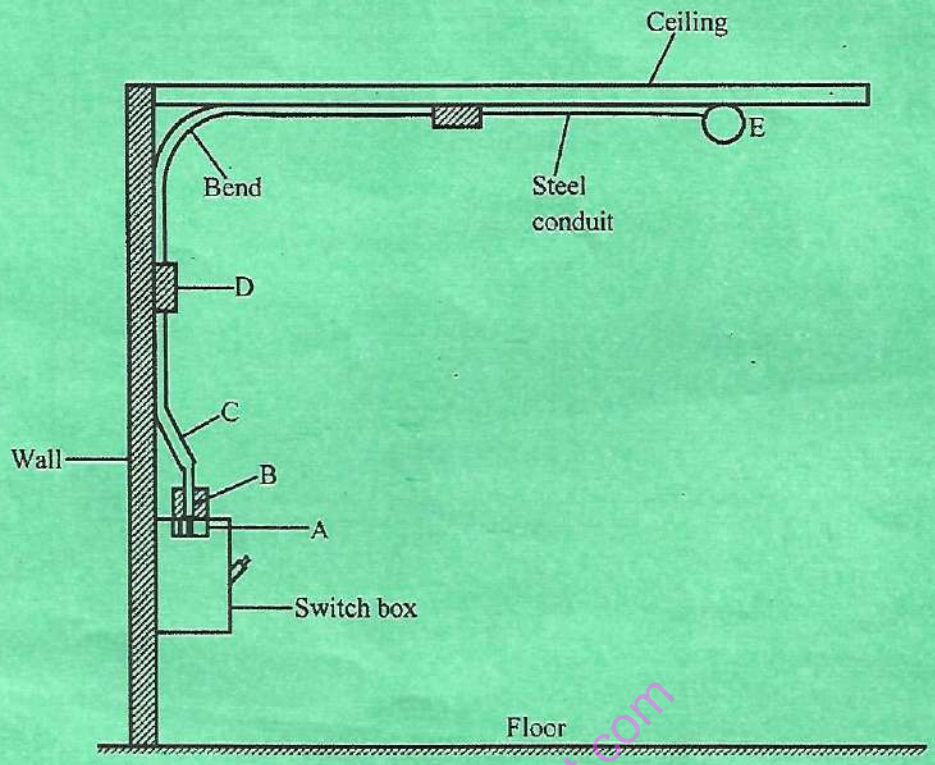


Fig. 2

(i) Identify the parts labelled A, B , C, D and E.

(ii) Outline the procedure of installation the steel conduit system in Figure 2.

(10 marks)

4. (a) Outline **three**:

(i) safety rules in an electrical workshop;

(ii) causes of electrical fires.

(6 marks)

(b) (i) Explain 'first aid'.

(ii) List **three** components of a first aid kit.

(5 marks)

(c) Outline the procedure of treating a person suffering from burns or scalds in a workshop.
(4 marks)

(d) (i) List two electric powered equipment used in the workshop.

(ii) Outline **three** safety measures observed when using the equipment in d(i).
(5 marks)

5. (a) Define the following:

(i) earth electrode;

(ii) earth lead.
(4 marks)

(b) List **two**:

(i) recommended types of earth continuity conductors.

(ii) Types of earth electrodes.
(4 marks)

(c) (i) Distinguish between fuse rating and fusing current as used in electrical protection.

(ii) Draw a labelled diagram of a semi-enclosed fuse.
(6 marks)

(d) (i) Define circuit breaker;

(ii) Outline **four** merits of a circuit breaker.
(6 marks)

SECTION B: SOLAR INSTALLATION TECHNOLOGY

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

6. (a) State **four** factors that determine the output of a solar module. (4 marks)

(b) Explain the following terms as used in solar batteries:

(i) state of charge;

(ii) self-discharge.

(4 marks)

(c) Distinguish between a DC-AC inverter and a D.C to DC converter. (4 marks)

(d) (i) With aid of a schematic diagram, explain the operation of a solar cell.

(ii) Name **two** types of solar cell constructions.

(8 marks)

7. (a) Explain the following solar energy terminologies:

(i) solar radiance;

(ii) peak sun hours.

(4 marks)

(b) Outline **four** benefits of using solar energy. (4 marks)

(c) With aid of a labelled diagram, explain the parabolic dish method of harvesting solar energy. (5 marks)

(d) (i) Draw a labelled diagram of a solar box cooker.

(ii) State **two** merits of using the cooker in d (i).

(7 marks)

8. (a) State **four** maintenance procedures for a solar battery. (4 marks)

(b) (i) Outline **three** IEE regulation requirements that govern solar batteries installation.

(ii) State **three** reasons for a lighting system failure to operate when connected to a newly installed P.V. solar system. (6 marks)

(c) Explain the following terms as used in P.V solar sizing:

(i) total daily system energy requirement;

(ii) voltage drop.

(4 marks)

(d) A one roomed house has the following:

- one 8 watt fluorescent lamp used 4 hours daily;
- one 60 watt refrigerator used 24 hours daily;
- one 40 watt coloured TV used for 3 hours daily.

Determine the:

(i) total daily load demand;

(ii) number of P.V module required if the P.V module generation factor is 3.4.

(N.B. Neglect system losses.)

(6 marks)

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