

ELECTRICAL INSTALLATION

POWER SUPPLY

ELECTRICITY SUPPLY SPECIFICATION ✓

Electricity supply for domestic consumers according to MS LEC 60038 standards meets the following specifications.

- 1) Single Phase supply with nominal voltage of 230V, range $+10\%$ - -6%
- 2) Three Phase supply with nominal voltage of 400V $+10\%$ - -6%
- 3) Permitted frequency is 50Hz $\pm 1\%$ ✓
- 4) Earthing system ✓

Electrical Installation

1. Domestic installation - Homes -
2. Commercial installation - Business
3. Industrial installation - High voltage supply.
4. Special installation - Swimming pools, Petrol Station.

Per risk
classification
indication
SPECIES

Planning the
installation
of electrical
installations

Electrical Wiring

Legal requirements

Regulation 11 (G1) of electricity regulations 1994 states that all wiring or rewiring of an installation or extension to an existing installation or extension which shall be carried out by an electrical contractor have to obtained the approval in writing from licensee/supply authority.

Planning of electrical wiring work.

- Prior to carry out wiring work, the contractor should plan and determine the task to be undertaken so that the work carried out is tidy, neat, and safe to be used.

The contractor shall:

- i) Undertake the site visit ✓
- ii) Determine the consumer load requirement ✓
- iii) Calculate the maximum load demand ✓

Site visit
Consumer load
requirement
Calculate maximum
load demand
Maximum Demand

iv) Submit plans, drawings and specifications ✓

Site visit

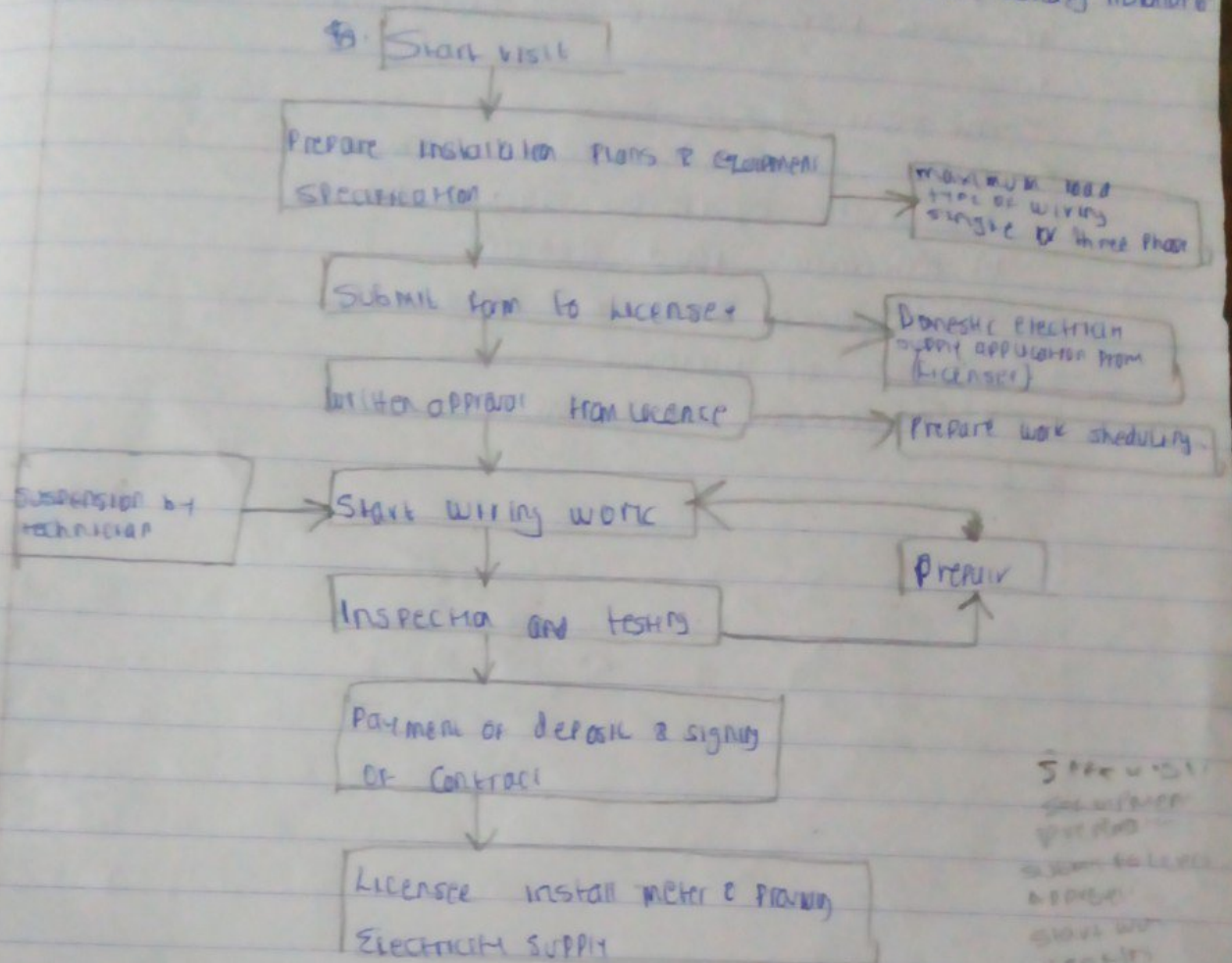
The purpose of site visit is to determine

- (i) Electrical equipments suitable for use ✓
- (ii) Maximum load demand ✓
- (iii) Single or 3 phase supply
- (iv) Type of wiring
- (v) Equipment arrangement

Electrical equipment
Maximum load
Single or 3 phase
Type of wiring
Equipment arrangement

Electrical equipment
Maximum load
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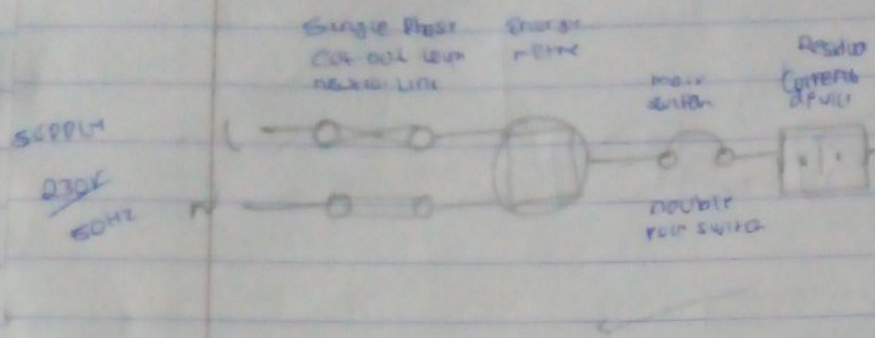
Planning how chad for single and three phase supply building installation



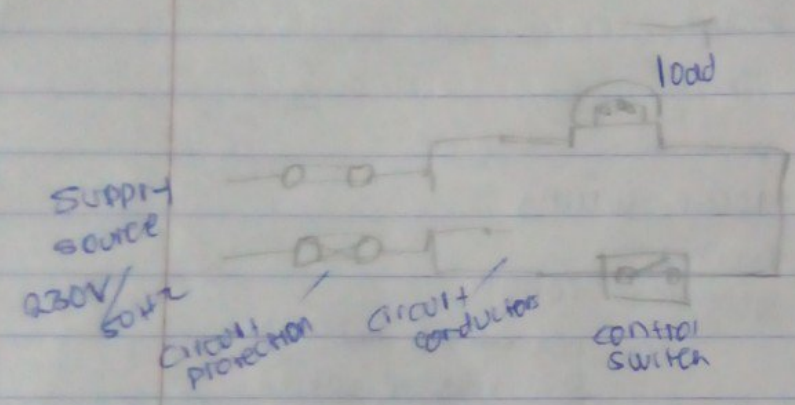
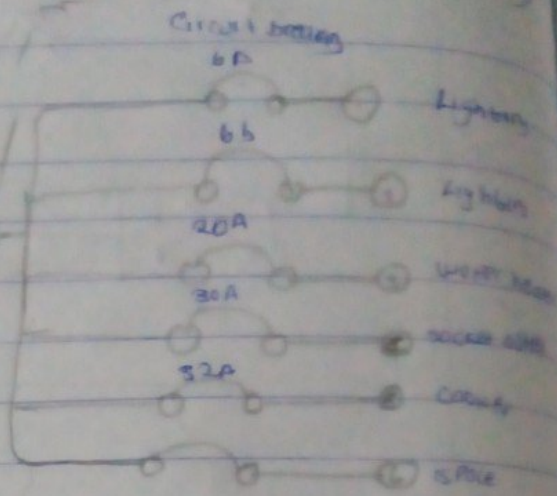
Features Of electrical wiring-

Electrical wiring composes of electrical equipment such as cables, switch boards, main switches, miniature circuit breakers (MCB) or fuses, Residual current device (RCD), lighting points, lightning arrestors etc.

Example of a single phase consumer electrical wiring. (Intake from)

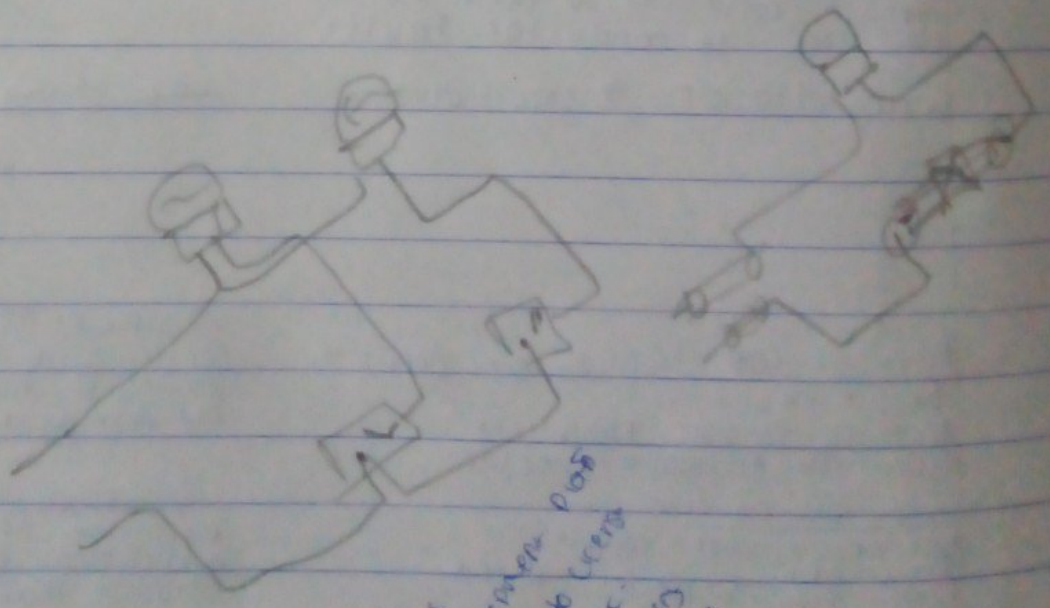


CCU (Consumer Unit)



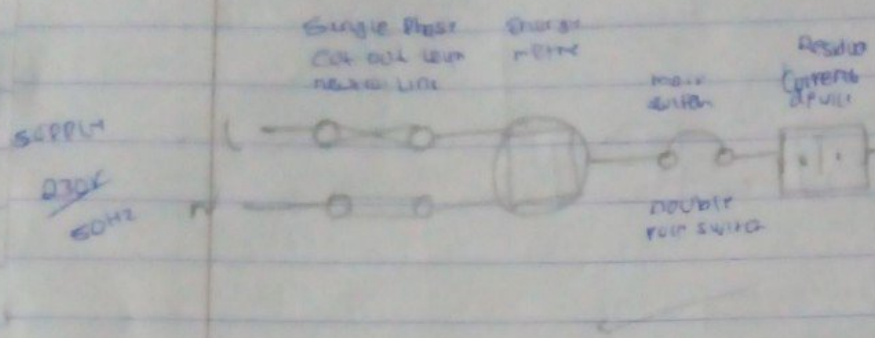
Main parts of a CCT

1. Control circuit
2. Load
3. Circuit conductor
4. Circuit protection
5. Source or supply

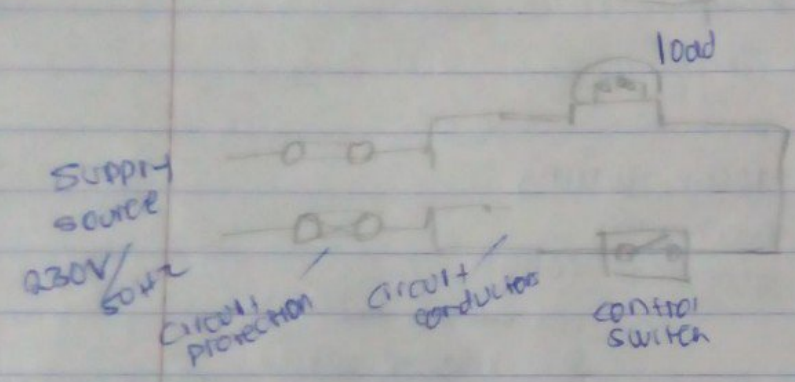
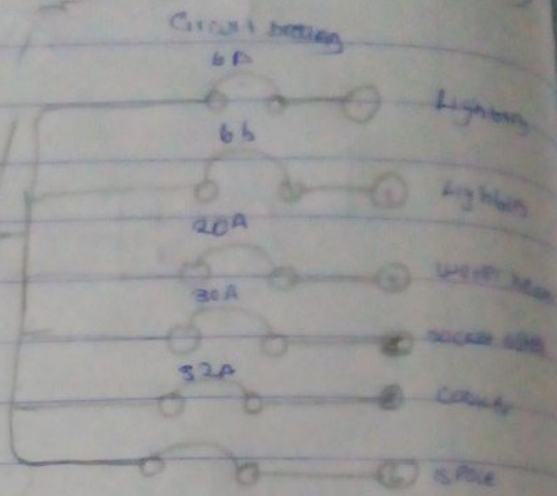


1. The 'Load' is the main part of the circuit. It is the part that consumes the electrical energy. It can be a motor, a lamp, a heater, or any other electrical device. The load is connected to the main supply line through a control switch and circuit protection.

2. The 'Control switch' is a device that is used to start and stop the flow of electrical current in the circuit. It is connected in series with the load. The control switch is usually operated by a person or a mechanical device. It is used to control the operation of the load.

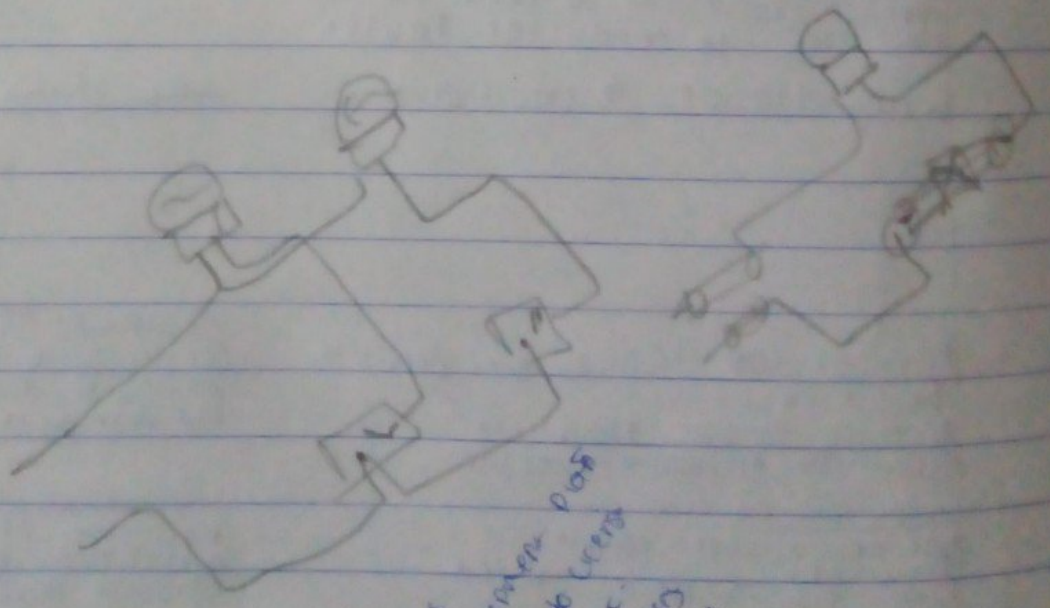


CCU (Consumer Unit)



Main parts of a CCT

1. Control circuit
2. load
3. Circuit conductor
4. Circuit protection
5. Source or supply



The visit
and maintain
form to keep
wiring
to inspect
new or damaged
mem

Start visit
Prepar for maintenance
Submit form
Start with inspection
Inspection & testing
Payment of charges
Install mem

(4marks)

1. (a) State FOUR factors determining the severity of electric shock.

(b) Explain THREE reasons why circuit breakers fail to trip (3marks)

(c) State FOUR ways employers ensure safety of workers against electric shock.

(4marks)

(d) State TWO types of short circuit faults in electrical installation.

(2marks)

(e) Distinguish between a wiring diagram and a circuit diagram.

(2marks)

(f) Name FOUR wiring system used for lighting and small power installations.

(2marks)

(g) Sketch the following final-sub circuits as used in domestic installation.

(12marks)

i. sequence of control at the intake point for a single phase supply system.

ii. A lamp controlled from one position.

iii. A lamp controlled from two positions.

iv. A lamp controlled from three positions.

v. A radial final circuit of 2 -13A socket outlet.

vi. A ring circuit of 2-13A socket outlet.

(h) Explain what is earthing as applied in electrical installations.

(1mark)

(b.) State FOUR tests carried out in a completed electrical installation.

(4 marks)

(c.) Draw the electrical symbols of the following as used in electrical installation.

(i) Consumer control unit

(ii) Energy meter

(iii) Switched socket outlet

(iv) Fuse link

(v) Intermediate switch

(10marks)

QUESTION FOUR (20 MARKS)

4. (a) State any THREE advantages of trunking over conduit wiring system.

(3 marks)

(b) State THREE main causes of accidents in an electric workshop

(3 marks)

(c) State FOUR steps that need to be taken when a person is being electrocuted

(4marks)

(d.) (i) Define electrical installation.

(4marks)

(ii) State any THREE purposes of I.E.E. regulation requirements in building.

(6marks)

QUESTION FIVE (20 MARKS)

5. (a) Describe the process of applying for power supply to the public electricity supplier (KPLC)

and the activities that take place before the applicant is given the required supply.

(10marks)

(b) Explain the purpose and procedure of conducting insulation resistance test, indicating instrument used, and expected reading.

(10marks)

QUESTION TWO (20 MARKS)

- a) Testing and inspection form an important component of electrical installation practices.
- (i) Distinguish between inspection and testing as carried out on electrical installation.
 - (ii) Describe **three** situations under which inspection and testing are carried out. (5 m)
- b) (i) What is the significance of performing an earth electrode test on an electrical installation?
- (ii) With the aid of a well-labelled diagram, describe the procedure for an earth electrode testing on a new installation stating the instrument used. (11 m)
- c) Explain how protection against direct and indirect shock is achieved on an electrical installation. (4 m)

Qn

Question Four

(a) Reduce costs

Increase network flexibility

Eliminate network overlap

(b) Contact with live wires resulting in electric shock and burns
Working on unsafe equipment
Old damaged appliances

(c) Turn off electric source

Begin CPR if the person shows no sign of circulation

Try to prevent the injured person from becoming chilled

In case of burns, apply bandage

(d) (i) Electrical installation is the construction / installation of ~~an~~ electrical wiring and the permanent attachment of ~~the~~ electrical products in any structure that is not itself an electrical product

(ii)

Question One.

- 1(a) Voltage and current strength of the system.
Area of contact or the body to the faulty machine.
Period of contact to the faulty system.
Resistance of the body.

(b) Overloaded Circuit.

If there are too many lights or appliances on at a time on one circuit, it can overload and cause circuit breaker to trip.

Loose Wiring.

A loose wiring can cause a circuit breaker fail to trip.

Overheating.

Overheating can make a circuit breaker become faulty and fail to trip.

Unregulated Voltage.

High and low voltage can make a circuit breaker fail to perform normally as it is designed to work under certain voltage.

C. Use well insulated cables.

Ensure the workers avoid working near electric line when possible.

Provide all employees with adequate training and information on electric safety.

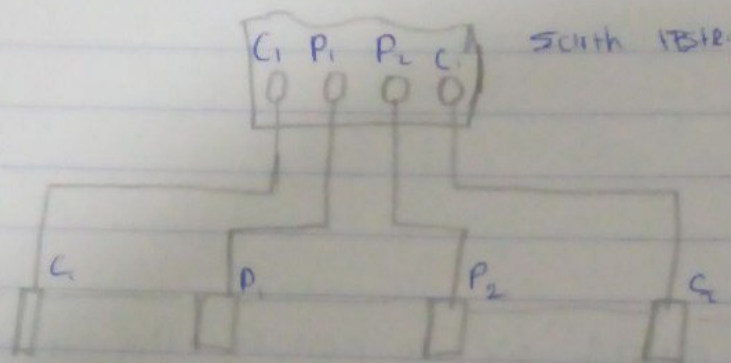
Ensure equipment has undergone all necessary safety checks before use.

(d) Single conductor to earth fault.

Phase to phase conductor to conductor fault.

From some distance at P_1 earth electrode and connect P_2 terminal of earth by insulated wire.

- Drive another current electrode (C_2) at depth of 6-12 inches from distance P_2 earth electrode and connect to C_2 by insulated wire.



Press start & read resistance value

Record the reading.

Repeat the steps by increasing spacing between each electrode at equal distance and measure earth resistance value.

Average all the readings.

(C) Protection against direct contact

(i) Insulation of energized parts.

Wires are often double insulated, and insulation is additionally strengthened to improve resistance temperature.

(ii) Casings protecting against contact.

Applicable where surfaces are horizontal.

Protection against indirect contact

(i) Reducing the earth fault loop impedance.

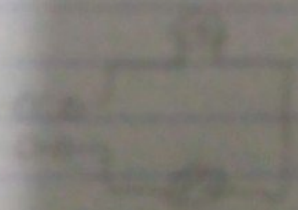
(ii) Using an RCD breaker that cuts off the power supply in the event of a residual current.

1) Current carrying capacity should be properly calculated. And
 and should be for maximum duration and it should be in proper
 manner.
 Current carrying capacity is used to know the capacity of electrical
 system and it is used in industry.

1) Current carrying
 Capacity and carrying capacity
 Power capacity
 Current capacity

(g)

(a)



(b)



(c)

Question 5

(a) Step 1.

Make the application

Go to the nearest KPLC office near you or Huduma Centre to make application

You will be given a supply contract to fill and sign

Following documents are required:

A copy of I.D

Pin Certificate

Whiting Certificate

Supply contract form

Step 2:

KPLC site visit-

KPLC will conduct an external site inspection to verify standards compliance

Step 3:

Pay estimate

Depending on estimated cost, you should proceed to make payment

Step 4

Electric connection.

After presentation of the payment receipt, you will receive external works, meter installation and electricity flow.

Question two

(a) (i) Testing involves testing a product against specific standard or regulation whereas inspection involves checking a random sample of an order for compliance with requirements and specifications.

(ii)

(b) The test is carried out to satisfy that it will provide a permanent and reliable connection to earth with a satisfactory low value of resistance to earth throughout its period of use.

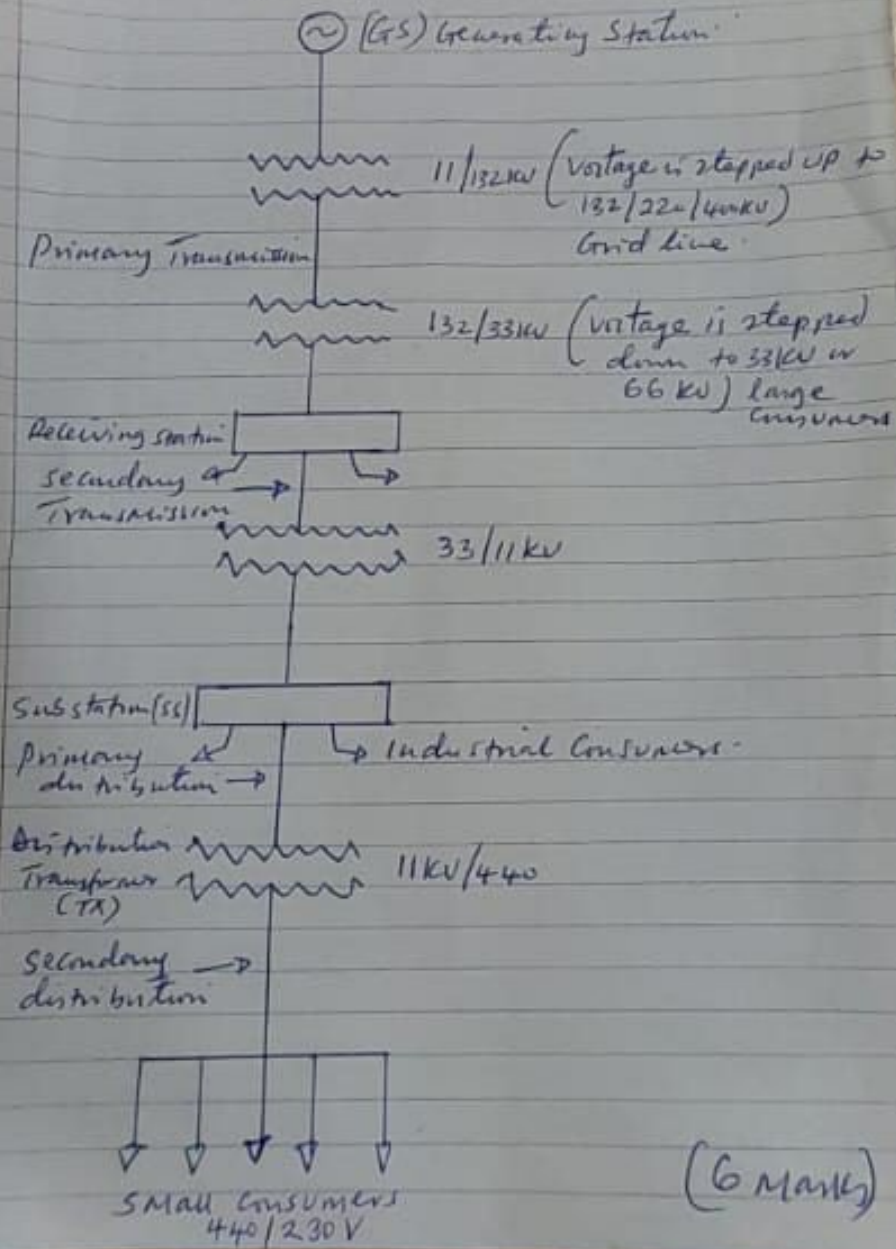
(ii) Instrument used

Earth Tester.

Procedure

- Isolate the grounding electrode under measurement by disconnecting it from the rest of the systems.
- Earth tester has 4 set terminals, two current terminals marked C_1 and C_2 and two potential terminals marked P_1 & P_2 .
- Four small sized electrodes are driven into the soil at the same depth and equal distance from one another in a straight line.
- The distance between earth electrodes should be at least 20 times greater than the electrode depth in ground.
- Electrode under measurement is connected to C_1 terminal of earth tester.
- Drive another potential earth terminal P_1 at depth of 6-12 inches from some distance at C_1 electrode and connect P_1 terminal of earth tester by insulated wire.
- Drive another potential earth terminal P_2 at depth 6-12 inches

Q1 a) Line diagram of a generating station



(6 Marks)

Q1 a) Line diagram of a Generating station

