BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, First Semester,
End – Semester Examination

Course Code: ELE1101 **Time: 2 Hours**
Course Name: Construction Electrician **Max. Marks: 50**

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. What is the unit of conductivity?
   (a) Ω·m (b) Ω/m (c) $(\Omega \cdot m)^{-1}$ (d) None of these
2. There is painful shock in human body when he/she touches the live bare wire at what level of current?
   (a) 1000 mA (b) 50 mA (c) 20 mA (d) 100 mA
3. Which is the symbol of lamp mounted on the wall?
   (a)  (b)  (c)  (d) 
4. What is the approximately resistance of a wet skin of human body?
   (a) 500 Ohms (b) 1000 Ohms (c) 10 Ohms (d) None of these
5. NEC stands for _____.
   (a) National Economic Council (b) National Electrical Code
   (c) No Existing Category (d) National Earthing Center
6. SPDT stands for _____.
   (a) Single Pole Double Throw (b) Standard Pole Double Throw
   (c) Standard Power Double Transmission (d) Single Power Double Transmission
7. What is the colour of earthing wire in the electrical cable?
   (a) Yellow (b) Red (c) Green (d) Gray
8. The earth electrodes are generally made of which material.
   (a) PVC (b) Galvanizes Iron (c) Rubber (d) None of these
9. How much voltage is there in single phase AC supply in India?
   (a) 240 Volts (b) 110 Volts (c) 50 Volts (d) 440 Volts
10. Which device is the used for electrical protection?
    (a) Fuse (b) MCB (c) RCCB (d) All of these

Section – B

04x04 = 16 Marks

1. Write the uses of any four hand tools used in electrical wiring.
2. Describe any four wire joints.
3. What is the concealed and non-concealed conduit wiring? also write their advantages and disadvantages.
4. Suppose, a consumer consumes 1000 watts load per hour daily for one month. Calculate the total energy bill of the consumer if per unit rate is 8.50 Rs. [Take 1 month = 30 Days].

Section – C

04x06 = 24 Marks

1. Explain pipe and plate earth electrodes for earthing.
2. Explain any six types of plug and socket.
3. Explain any three essential components of induction type energy meter.
4. Explain following terminology:
   1. Dead
   2. Earth
   3. Earth fault
   4. Leakage current
   5. Step potential
   6. Touch potential

A

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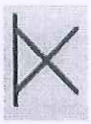
Answer key

Section – A

Ans 1. (c) $(\Omega \cdot m)^{-1}$

Ans 2. (c) 20 mA

Ans 3. (b) 

Ans 4. (b) 1000 Ohms

Ans 5. (b) National Electrical Code

Ans 6. (a) Single Pole Double Throw

Ans7. (c) Green

Ans 8. (b) Galvanizes Iron

Ans 9. (a) 240 Volts

Ans 10. (d) All of these

Section – B

Ans 1.

Combination pliers: It is multi-purpose pliers, combining gripping jaws with wire cutters. They can be used for gripping, compressing, bending, twisting, extracting and cutting various materials. The material used for pliers is steel alloys with additives such as vanadium and chromium.

Long-nose plier: It is a versatile tool that has long, tapering jaws with a pointed tip. Among their many uses are gripping, bending, and cutting small-gauge wire. They can reach into tight places that are inaccessible to other types of pliers. The material used for pliers is steel alloys with additives such as vanadium and chromium.

Diagonal pliers: Wire cutters or diagonal cutting pliers or diagonal cutters or **side cutting pliers**) are pliers intended for the cutting of wire (they are generally not used to grab or turn anything). The material used for pliers is steel alloys with additives such as vanadium and chromium.

Adjustable wrench: It is also called an **adjustable spanner** is a tool, which can be used to loosen or tighten a nut or bolt. It has a "jaw" (the part where the nut or bolt fits), which is of adjustable size. Open the adjustable wrench by turning the screw mechanism. The range of this wrench is 0 to 24 mm.

Ans 2.

Pig-tail/Rat-tail/Twisted joint: This joint is suitable for pieces where there is no mechanical stress on the conductors, as found in the junction box or conduit accessories box. However, the joint should maintain good electrical conductivity.

Married joint: A married joint is used in places where appreciable electrical conductivity is required, along with compactness. As the mechanical strength is less, this joint could be used at places where the tensile stress is not too great.

Tee joint: This joint could be used in overhead distribution lines where the electrical energy is to be tapped for service connections.

Britannia joint: This joint is used in overhead lines where considerable tensile strength is required. It is also used both for inside and outside wiring where single conductors of diameter 4 mm or more are used.

Ans 3.

Conduit Wiring: There are two types of conduit wiring according to pipe installation:

Non-concealed conduit wiring: Surface Conduit Wiring When GI or PVC conduits are installed on walls or roof; it is known as surface conduit wiring. The conduits are attached to the walls with a 2-hole strap and base clip at regular distances. Electrical wires are laid inside the conduits.

Concealed Conduit Wiring: When the conduits are hidden inside the wall slots or chiseled brick wall, it is called concealed conduit wiring. Electrical wires are laid inside the conduits. This is popular since it is stronger and more aesthetically appealing.

Advantages

- It is a safe wiring system
- Safe from chemical effects, humidity and other external factors
- No risk of shock
- It is aesthetically appealing
- No risk of wear and tear, fire or damaged cable insulation
- Quite reliable
- Renovations can be easily performed as you can replace old wires easily

Disadvantages

- Expensive as compared to surface conduit wiring
- Changing the location of switches or appliances is difficult

- Installation is complex
- Hard to find defects in the wiring
- Adding additional conduit in future is a tedious task

Ans 4.

1unit = 1kWh.

So Total kWh = 1000 Watts x 24 Hrs x 30 Days

= 720000 watts-hour.

we have to convert it into Units,

Where is 1unit = 1kWh.

So total Consumed units. 720000/1000..... (k=kilo=1000).

Total Units = 720.

Cost of per unit is 8.50 Rs.

So total Cost or Electricity bill= 720 x 8.5 = **6120.Rs.**

Section – C

Ans 1.

Rod and pipe electrodes (Fig 4): These electrodes shall be made of metal rod or pipe having a clean surface not covered by paint, enamel or other poorly conducting material.

Rod electrodes of steel or galvanized iron shall be at least 16 mm in diameter, and those of copper shall be at least 12.5 mm in diameter.

Pipe electrodes shall not be smaller than 38 mm internal diameter, if made of galvanized iron or steel, and 100 mm internal diameter if made of cast iron.

Electrodes shall, as far as practicable, be embedded in earth below the permanent moisture level.

The length of the rod and pipe electrodes shall not be less than 2.5 m.

Except where rock is encountered, pipes and rods shall be driven to a depth of at least 2.5 m. Where rock is encountered at a depth of less than 2.5 m, the electrodes may be buried, inclined to the vertical. In this case too, the length of the electrodes shall be at least 2.5 m, and the inclination not more than 300 from the vertical.

Deeply driven pipes and rods are, however, effective where the soil resistivity decreases with depth or where a sub-stratum of low resistivity occurs at a depth greater than those to which rods and pipes are normally driven.

Pipes or rods, as far as possible, shall be of one piece.

For deeply driven rods, joints between sections shall be made by means of a screwed coupling, which should not be of a greater diameter than that of the rods which it connects together.

Plate electrodes (Fig 5): Plate electrodes, when made of galvanized iron or steel, shall not be less than 6.3 mm in thickness. Plate electrodes of copper shall be not less than 3.15 mm in thickness. Plate electrodes shall be of a size, at least 60 cm by 60 cm.

Plate electrodes shall be buried such that the top edge is at a depth not less than 1.5 m from the surface of the ground.

Where the resistance of one plate electrode is higher than the required value, two or more plates shall be used in parallel. In such a case, the two plates shall be separated from each other by not less than 8.0 m.

Plates shall preferably be set vertically.

Use of plate electrodes is recommended only where the current-carrying capacity is the prime consideration; for example, in generating stations and substations.

If necessary, plate electrodes shall have a galvanized iron water pipe buried vertically and adjacent to the electrode. One end of the pipe shall be at least 5 cm above the surface of the ground, and it need not be more than 10 cm. The internal diameter of the pipe shall be at least 5 cm and need not be more than 10 cm. The length of pipe, if under the earth's surface, shall be such that it should be able to reach the center of the plate. In no case, however, shall it be more than the depth of the bottom edge of the plate.

Ans 2.

Type A:

- It is mainly used in the USA, Canada, Mexico & Japan.
- 2 pins
- not grounded
- 15 A
- almost always 100 – 127 V
- socket compatible with plug type A

Type B:

- It is mainly used in the USA, Canada, Mexico & Japan.
- 3 pins
- grounded
- 15 A
- almost always 100 – 127 V
- socket compatible with plug types A & B

Type C:

- It is commonly used in Europe, South America & Asia.
- 2 pins

- not grounded
- 2.5 A
- almost always 220 – 240 V
- socket compatible with plug type C

Type D:

- It is mainly used in India.
- 3 pins
- grounded
- 5 A
- 220 – 240 V
- socket compatible with plug type D
  (partial and unsafe compatibility with C, E & F)

Type E:

- It is primarily used in France, Belgium, Poland, Slovakia & Czechia.
- 2 pins
- grounded
- 16 A
- 220 – 240 V
- socket compatible with plug types C, E & F

Type F:

- It is used almost everywhere in Europe & Russia, except for the UK & Ireland.
- 2 pins
- grounded
- 16 A
- 220 – 240 V
- socket compatible with plug types C, E & F

Ans 3.

1. Driving system: It has two magnets.

Series magnet carries a coil which is of few turns of thick wire connected in series with line whereas shunt magnet carries coil with many turns of thin wire connected across the supply.

Series magnet produces the flux which is proportional to the current flowing and shunt magnet produces the flux proportional to the voltage. These two fluxes lag by 90 degrees due to inductive nature. The interaction of these two fields produces eddy current in the disk, exerting a force, which is proportional to product of instantaneous voltage, current and phase angle between them.

The copper shading bands are also called the power factor compensator or compensating loop.

2. Moving system:

The moving system essentially consists of a light rotating aluminium disk mounted on a vertical spindle or shaft. The shaft that supports the aluminium disk is connected by a gear arrangement to the clock mechanism on the front of the meter to provide information that consumed energy by the load.

The time varying (sinusoidal) fluxes produced by shunt and series magnet induce eddy currents in the aluminium disc. The interaction between these two magnetic fields and eddy currents set up a driving torque in the disc. The number of rotations of the disk is therefore proportional to the energy consumed by the load in a certain time interval and is commonly measured in kilo watt-hours (Kwh).

3. Braking system:

Damping of the disk is provided by a small permanent magnet, located diametrically opposite to the a.c. magnets. The disk passes between the magnet gaps.

The movement of rotating disc through the magnetic field crossing the air gap sets up eddy currents in the disc that reacts with the magnetic field and exerts a braking torque.

By changing the position of the brake magnet or diverting some of the flux there form, the speed of the rotating disc can be controlled.

Ans 4.

1. Dead: Dead' means at or about earth potential and disconnected from any live system.

2. Earth: A connection to the general mass of earth by means of an earth electrode. An object is said to be `earthed' when it is electrically connected to an earth electrode; and a conductor is said to be `solidly earthed' when it is electrically connected to an earth electrode.

3. Earth fault: Live portion of an electrical system getting accidentally connected to earth.

4. Leakage current: A current of relatively small value, which passes through the insulation of conductive parts/wire.

5. Step potential: The maximum value of the potential difference possible of being shunted by a human body between two accessible points on the ground separated by the distance of one step, which may be assumed to be one meter.

6. Touch potential: The maximum value of potential difference between a point on the ground and a point touched by a person.

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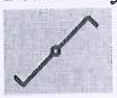
Section – A

10X01 = 10 Marks

1. Heart convulsions usually fatal at:
   (a) 100 mA (b) 50 mA (c) 66 mA (d) None of these
2. What is the unit of electrical energy?
   (a) kW (b) kVh (c) kWh (d) All of these
3. Which is the symbol of two-way switch?
   (a)  (b)  (c)  (d) 
4. The fuse is connected in _____ for all the electrical circuits.
   (a) Parallel (b) Series (c) Both (a) and (b) (b) None of these
5. ECC stands for _____.
   (a) Electrical circuit conductor (b) Earth circuit conductor
   (c) Earth-continuity conductor (d) None of these
6. RCCB stands for _____.
   (a) Residual Current Circuit Breaker (b) Resistance Current Circuit Breaker
   (c) Resistance Closed Circuit Breaker (d) Residual Closed Circuit Breaker
7. Which is the example of conductor?
   (a) Aluminum (b) Glass (c) Rubber (d) Plastic
8. What is the colour of neutral wire in the electrical cable?
   (a) Red (b) Green (c) Black (d) Gray
9. The earth tester works on which principle.
   (a) Deflection method (b) Absolute or Fundamental method
   (c) fall of potential method (d) None of these
10. Electrical energy meter is used to measure _____.
    (a) Voltage (b) Power (c) Energy (d) None of these

Section – B

04x04 = 16 Marks

1. Differentiate between the system and equipment earthing.
2. What is the earth resistance tester and the megger with their working?
3. Explain the staircase wiring. Draw the neat circuit diagram of it.
4. Suppose, a consumer consumes 1500 watts' load per hour daily for one month. Calculate the total energy bill of the consumer if per unit rate is 11.70 Rs. [Take 1 month = 30 Days].

Section – C

04x06 = 24 Marks

1. Explain principle, construction and working of earth resistance tester.
2. Explain earth leakage circuit breaker and also voltage operated and current operated ELCB.
3. Explain any three type of electrical switches.
4. Explain the following terms in detail:
   1. Fuse 2. MCB 3. ELCB

B

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Answer Key

Section – A

Ans 1. (b) 50 mA

Ans 2. (c) kWh

Ans 3. (b) 

Ans 4. (b) Series

Ans 5. (c) Earth-continuity conductor

Ans 6. (a) Residual Current Circuit Breaker

Ans 7. (a) Aluminum

Ans 8. (c) Black

Ans 9. (c) fall of potential method

Ans 10. (c) Energy

Section – B

Ans 11.

System Earthing: Earthing associated with current-carrying conductors is normally essential to the security of the system, and is generally known as system earthing. System earthing is done at generating stations and substations.

The purpose of system earthing is to:

- Maintain the ground at zero reference potential, thereby ensuring that the voltage on each live conductor is restricted to such a value with respect to the potential of the general mass of the earth as is consistent with the level of the insulation applied.
- Protect the system when any fault occurs against which earthing is designed to give protection, by making the protective gear to operate and make the faulty portion of the plant harmless.

In most cases such operation involves isolation of the faulty main or plant by circuit breakers or fuses. Earthing may not give protection against faults which are not essentially earth faults.

Equipment earthing: Earthing of non-current carrying metal work and conductor which is essential for the safety of human life, animals and property is generally known as equipment earthing.

Ans 2.

Earth resistance tester: It is an electrical measuring instrument used to measure the resistance between any two points of the earth. It is also called as earth tester. Even varieties of earth testers are available in market, the hand operated earth tester is explained below

Working: When DC is used in electrode resistance measurement the effect of electrolytic emf interferes with the measurement and the reading may go wrong. To avoid this, the supply to the electrodes should be AC.

To facilitate this the DC produced by the hand generator is changed to AC through a current reverser. After the alternating current passes through the electrodes, the measurement should be done by an ohmmeter which requires DC supply.

To change the alternating voltage, drop outside the instrument to direct voltage drop inside, a synchronous rotary rectifier is used (Fig 2)

Sometimes the meter needle vibrates during measurement due to the fact that strong alternating currents of the same frequency as the generated frequency enters the measuring circuit.

In such cases the handle rotating speed of the instrument may be either increased or decreased. In general, these instruments are designed such that the readings are not affected by strong currents or by electrolytic emfs.

Megger: It is an electrical measuring instrument generally used to measure the insulation resistance of an installation/ equipment etc in terms of Megaohms.

Working: The permanent magnets supply the flux for both the generator and the metering device. The voltage coils are connected in series across the generator terminals. The current coil is arranged so that it will be in series with the resistance to be measured. The unknown resistance is connected between the terminals L and E.

When the armature of the magnet is rotated, an emf is produced. This causes the current to flow through the current coil and the resistance being measured. The amount of current is determined by the value of the resistance and the output voltage of the generator.

The torque exerted on the meter movement is proportional to the value of current flowing through the current coil.

The current through the current coil, which is under the influence of the permanent magnet, develops a clockwise torque. The flux produced by the voltage coils reacts with the main field flux, and the voltage coils develop a counter-clockwise torque.

For a given armature speed, the current through the voltage coils is constant, and the strength of the current coil varies inversely with the value of resistance being measured.

As the voltage coils rotate counter-clockwise, they move away from the iron core and produce less torque.

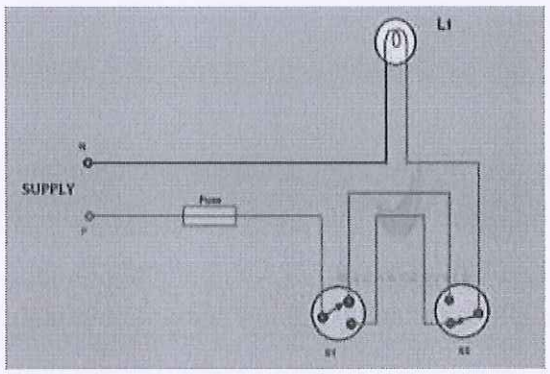
A point is reached for each value of resistance at which the torques of the current and voltage coils balance, providing an accurate measurement of the resistance. Since the instrument does not have a controlling torque to bring the pointer to zero, when the meter is not in use, the position of the pointer may be anywhere on the scale.

The speed at which the armature rotates does not affect the accuracy of the meter, because the current through both the circuits changes to the same extent for a given change in voltage. However, it is recommended to rotate the handle at the slip speed to obtain steady voltage.

Because megohmmeters are designed to measure very high values of resistance, they are frequently used for insulation tests.

Ans 3.

Staircase wiring: This is a common multi-way switching or two-way light switching connection, one light two switching wiring. Here one lamp is controlled by two switches from two different positions. That is to operate the load from separate positions such as above or below the staircase, from inside or outside of a room, or as a two-way bed switch, etc.



Ans 4.

1unit = 1kWh.

So Total kWh = 1500 Watts x 24 Hrs x 30 Days

= 1080000 watts-hour.

we have to convert it into Units,

Where is 1unit = 1kWh.

So total Consumed units. 1080000/1000..... (k=kilo=1000).

Total Units = 1080.

Cost of per unit is 11.70 Rs.

So total Cost or Electricity bill= 1080 x 11.70 = **Rs. 12,636 /-**

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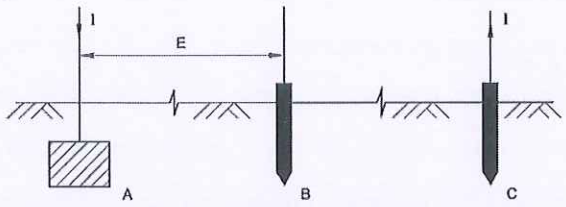
Section – C

Ans 1.

Principle: The earth tester works on the principle of the fall of potential method.

In this method the two auxiliary electrodes B and C are placed at a straight line (Fig 1).

Fig 1



FALL OF POTENTIAL METHOD

An alternating current of I_{amps} magnitude is passed through the electrode A to the electrode C via the earth and the potential across electrodes A and B is measured.

The resistance of electrodes B and C does not influence the measurement result.

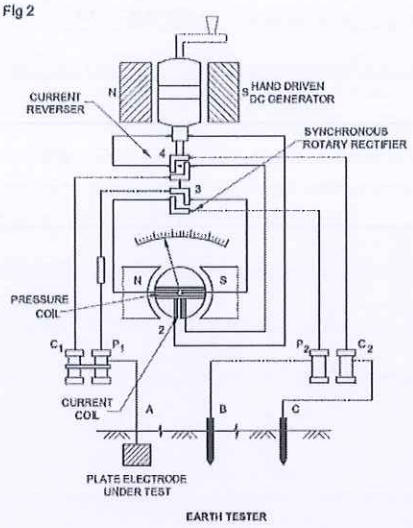
This is achieved by placing the electrode C at a sufficient distance from A so that the resistance areas of A and C are quite independent. A distance of above 15 meters between electrode A and C is regarded as sufficient distance.

Construction: The earth tester essentially consists of a hand drive generator which supplies the testing current and a direct reading ohmmeter (Fig 2).

The ohmmeter section of this instrument consists of two coils (potential and current coils) kept at 90o to each other and mounted on the same spindle. The pointer is attached to the spindle. The current coil carries a current proportional to the current in the test circuit whereas the potential coil carries a current proportional to the potential across the resistance under test.

Thus the current coil of the instrument acts as an ammeter in the fall of potential method and the pressure coil acts as the voltmeter. Since the deflection of the ohmmeter needle is proportional to the ratio of the current in the two coils, the meter gives resistance readings directly.

Fig 2



EARTH TESTER

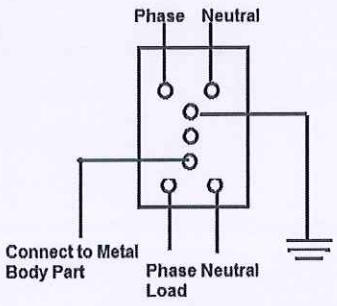
Ans 2.

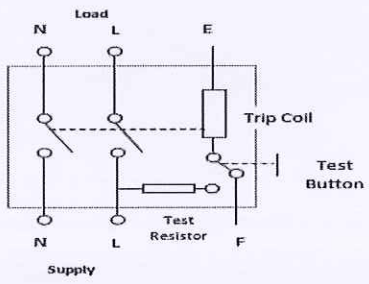
Earth leakage circuit breaker: An ELCB is a specific type of latching relay that has an incoming mains power associated through its switching contacts so that the circuit breaker detaches the power in an unsafe condition.

The ELCB notices fault currents of human or animal to the earth wire in the connection it guards. If ample voltage seems across the ELCB's sense coil, it will turn off the power, and remain off until manually rearrange.

Voltage Operate Earth Leakage Circuit Breaker: A single-phase voltage ELCB includes 6-terminals namely line in, line out, neutral in, neutral out, Earth and fault. The metal body of the load is associated with the fault terminal of the ELCB & Earth terminal is associated with the ground.

For usual working, the voltage across the trip coil is '0', as the Load's body is isolated from the supply line. When an Earth fault happens on the load due to the interaction of line wire to the metal body, a current will run through fault to the ground. The flow of current will set up a voltage across the trip coil, which is associated between E & F.

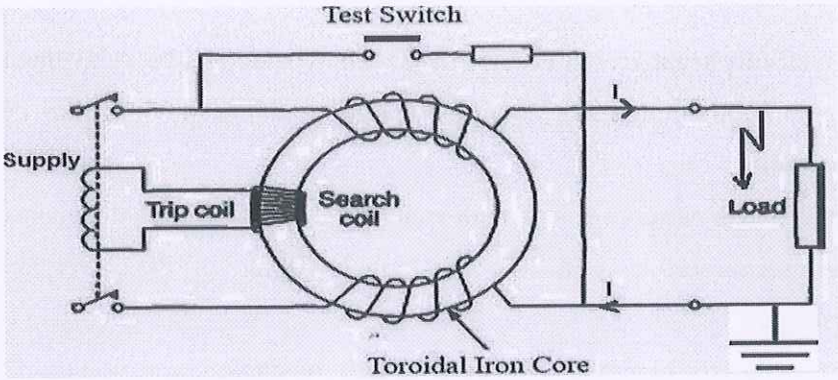




Current Operate Earth Leakage Circuit Breaker: It has three winding transformer, that has two primary windings and also one secondary winding. Neutral & line wires work as the two main

windings. A wire wound coil is the minor winding. The flow of current through the minor winding is "0" in the stable condition. In this condition, the flux induced by current in the phase wire will be deactivated by the current through the neutral wire, meanwhile the current, that flows from the phase will be refunded to the neutral.

When an error occurs, a slight current will run into the ground also. This creates a confuse between line and neutral current and that makes an unstable magnetic field. This encourages a current flow through the minor winding, which is associated with the sensing circuit. This will detect the outflow and direct signal to tripping system.

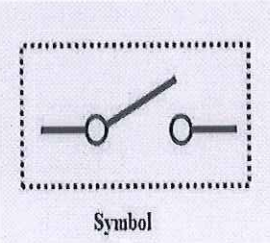


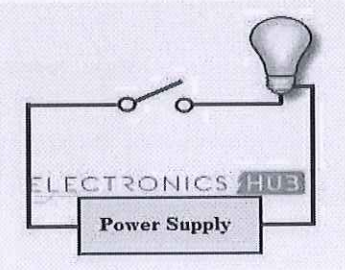
Ans 3.

Single Pole Single Throw Switch (SPST):

This is the basic ON and OFF switch consisting of one input contact and one output contact.

- It switches a single circuit and it can either make (ON) or break (OFF) the load.
- The contacts of SPST can be either normally open or normally closed configurations.



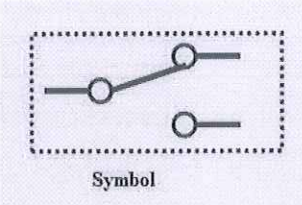


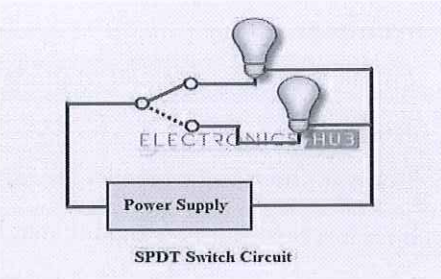
Single Pole Double Throw Switch (SPDT):

This switch has three terminals, one is input contact and remaining two are output contacts.

- This means it consists one ON position and one OFF position at a time.
- In most of the circuits, these switches are used as changeover to connect the input between two choices of outputs.

- The contact which is connected to the input by default is referred as normally closed contact and contact which will be connected during ON operation is a normally open contact.





SPDT Switch Circuit

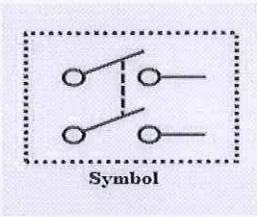
Double Pole Single Throw Switch (DPST): This switch consists of four terminals, two input contacts and two output contacts.

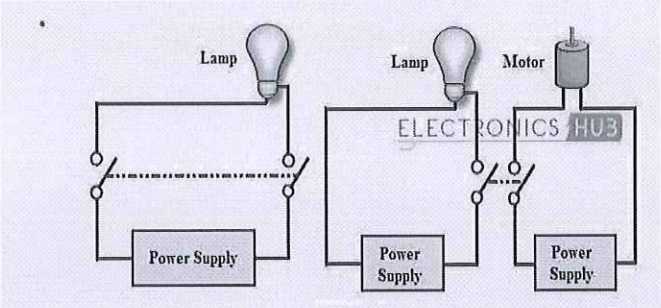
It behaves like a two separate SPST configurations, operating at the same time.

It has only one ON position, but it can actuate the two contacts simultaneously, such that each input contact will be connected to its corresponding output contact.

In OFF position both switches are at open state.

This type of switches is used for controlling two different circuits at a time.





Ans 4.

1. **Fuse:**
   - A fuse is a type of low resistance resistor that acts as a sacrificial device to provide over current protection, of either the load or short circuit.

   Working Principle:
   - The power consumed in an electrical circuit is reflected as the heat generated.
   - The fuse wire is made of zinc, copper, silver, aluminium, or alloys. In general, it is an alloy of tin(Sn) and lead (Pb) having composition 63% Sn and 37% Pb.
   - Resistance of the wire is constant. If current in the circuit exceeds more than the rated current, then the heat generated also exceeds and which causes the meltdown of fuse wire.
   - Fuse is connected in series in a circuit.

2. **MCB:** A MCB is a manually or automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit.

Working:

An MCB functions by interrupting the continuity of electrical flow through the circuit once a fault is detected.

There are two contacts one is fixed and the other moveable. When the current exceeds the predefined limit a solenoid forces the moveable contact to open (i.e., disconnect from the fixed contact) and the MCB turns off thereby stopping the current to flow in the circuit.

In order to restart the flow of current the MCB is manually turned on. This mechanism is used to protect from the faults arising due to over current or over load.

3. **ELCB:**

- An ELCB is a specific type of latching relay that has a incoming mains power associated through its switching contacts so that the circuit breaker detaches the power in an unsafe condition.
- The ELCB notices fault currents of human or animal to the earth wire in the connection it guards.
- If ample voltage seems across the ELCB's sense coil, it will turn off the power, and remain off until manually rearrange.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, I Semester,

End-Sem. Examination

Course Code: ELE1102 **Time: 2 Hours**

Course Name: Electrical Drawing **Max. Marks: 50**

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. The default position of the UCS icon is positioned at _____ on the Auto-CAD grid.
   (a) 0, 0, 0 (b) 10, 10, 10
   (c) 20, 20, 20 (d) None of the above

2. Which mode allows the user to draw 90° straight lines:
   (a) Osnap (b) Ortho
   (c) Linear (d) Polar tracking

3. AutoCAD was developed by-
   (a) Microsoft Corp. (b) Apple Inc.
   (c) Autodesk Inc. (d) None of these

4. A user can adjust the Drawing _____ command to control the size of the drawing area.
   (a) Units (b) Limits
   (c) Snap (d) None of the above

5. Some of the common terms used to describe technical drawing include:
   (a) Drafting (b) Engineering Graphics
   (c) Engineering Drawing (d) All of these

6. The following is not included in title block of drawing sheet.
   (a) Sheet No (b) Scale
   (c) Method of Projection (d) Size of sheet

7. Which of the following represent reducing scale?
   (a) 1:1 (b) 1:2 (c) 2:1 (d) 10:1

8. How many SNAP points does an object have?
   (a) 1 (b) 5 (c) 4 (d) Depend on object

9. How much long will a line from 0,5 to 5,5 be _____.
   (a) 5 units (b) 10 units (b) 15 units (d) None of these

10. The origin of a drawing is at ____?
    (a) 0,1 (b) 1,0 (c) 0,0 (d) 1,1

A

Section – B

04X04 = 16 Marks

1. What do you understand by term "Electrical Drawing"?
2. What are the standard size of drawing sheet?
3. Explain the following terms with respect to AutoCAD software-
   (a) Drawing Area
   (b) Command Area
4. What functions can be performed by CAD software?

Section – C

04X06 = 24 Marks

1. Write down the objective of Electrical Drawing. What are different methods to draw a line in the AutoCAD?
2. Differentiate between circuit diagram and wiring diagram.
3. Find the distance and midpoint between the points (−3,−1) and (2,3).
4. Draw standard symbols commonly used in electrical drawings-
   (a) Air Circuit Breaker
   (b) Fuse Cutout
   (c) Double-Throw Switch

Answer Key Set – A
Course Code: ELE1102, Course Name: Electrical Drawing
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, I Semester, End-Sem. Examination

Section – A

1. (a) 0, 0, 0
2. (b) Ortho
3. (c) Autodesk Inc.
4. (b) Limits
5. (d) All of the above
6. (d) Size of sheet
7. (b) 1:2
8. (d) Depend on object
9. (a) 5 units
10. (c) 0,0

Section – B

1. Electrical drawings are the representation of electrical components and connected wiring to fulfill a specific purpose. An electrical drawing can be of a house, industry or an electrical panel.

2.

Table 1.2 Standard Sizes of Drawing sheets as per BIS

Designation	Size (mm)
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297

3. Drawing area: To provide space to prepare a drawing.
Command area: To allow the entry of various commands for preparing the drawings

4.

Major function to be performed by a computer aided drafting system:-

1. Basic setup of drawing.
2. Drawing the objects
3. changing the objects properties
4. Translating the objects
5. Scaling the objects.

4

6. clipping the objects to fit image to the screen
7. creating symbol libraries for frequently used objects.
8. Text insertion.
9. Dimensioning.

Answer Key Set – A
Course Code: ELE1102, Course Name: Electrical Drawing
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, I Semester, End-Sem. Examination

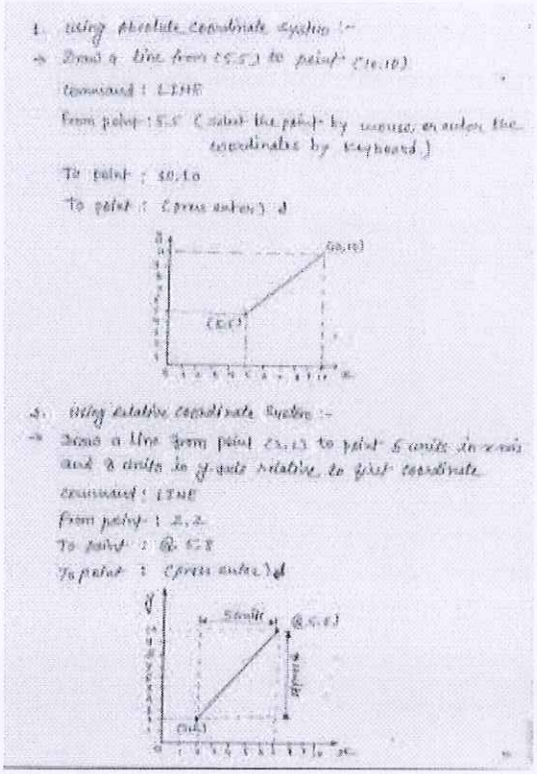
Section – C

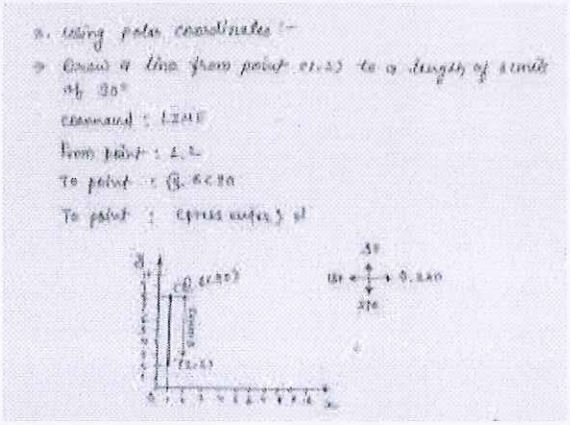
1. Drawing for an electrical project serves three distinct functions-

(a) Describes the electrical project in sufficient detail to allow electrical contractors to use the drawings in estimating the cost of materials, labor, and services when preparing a contract bid.

(b) Instructs and guides electricians in performing the required wiring and equipment installation while also warning them of potential hazards such as existing wiring, gas pipes, or plumbing systems.

(c) Provides the owner with an "as-built" record of the installed electrical wiring and equipment for the purposes of maintenance or planning future expansion. The owner then becomes responsible for recording all wiring and equipment changes.





2. **Circuit diagram-** A circuit diagram shows how the electrical components are connected together and uses:

- Symbols to represent the components;
- Lines to represent the functional conductors or wires which connect them together.

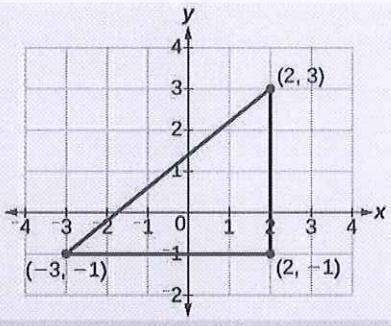
A circuit drawing is derived from a block or functional diagram). It does not generally bear any relationship to the physical shape, size or layout of the parts and although you could wire up an assembly from the information given in it, they are usually intended to show the detail of how an electrical circuit works.

Wiring diagram- This is the drawing which shows all the wiring between the parts, such as:

- Control or signal functions;
- Power supplies and earth connections;
- Termination of unused leads, contacts;
- Interconnection via terminal posts, blocks, plugs, sockets.

It will have details, such as the terminal identification numbers which enable us to wire the unit together. Parts of the wiring diagram may simply be shown as blocks with no indication as to the electrical components inside. These are usually sub-assemblies made separately, i.e. pre-assembled circuits or modules

3.



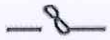
Then, calculate the length of d using the distance formula.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(2 - (-3))^2 + (3 - (-1))^2}$$
$$= \sqrt{(5)^2 + (4)^2}$$
$$= \sqrt{25 + 16}$$
$$= \sqrt{41}$$

Use the formula to find the midpoint of the line segment.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{7+9}{2}, \frac{-2+5}{2}\right)$$
$$= \left(8, \frac{3}{2}\right)$$

4. (a) Air Circuit Breaker

(b) Fuse Cutout 

(c) Double-Throw Switch 

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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School of Electrical Skills

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B. Voc. Program, I Semester,

End-Sem. Examination

Course Code: ELE1102 **Time: 2 Hours**

Course Name: Electrical Drawing **Max. Marks: 50**

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. The following is not included in title block of drawing sheet.
   (a) Sheet No (b) Scale
   (c) Method of Projection (d) Size of sheet

2. Which of the following represent reducing scale?
   (a) 1:1 (b) 1:2
   (c) 2:1 (d) 10:1

3. The following line is used for dimension line:
   (a) Continuous thick (b) Continuous thin
   (c) Chain thin line (d) Short zigzag thin

4. The designation of sheet of size 594 x 841 is
   (a) A0 (b) A1 (c) A2 (d) A3

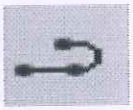
5. To insure that everyone understands what the electrical symbols represent it is customary to include a _____ on the electrical sheet.
   (a) List (b) Part number
   (c) Electrical legend (d) Electrical layer

6. The default position of the UCS icon is positioned at _____ on the Auto-CAD grid.
   (a) 0, 0, 0 (b) 10, 10, 10
   (c) 20, 20, 20 (d) None of these

7. Which mode allows the user to draw 90° straight lines:
   (a) Osnap (b) Ortho
   (c) Linear (d) Polar tracking

8. How many SNAP points does an object have?
   (a) 1 (b) 5 (c) 4 (d) Depend on object

9. What does following AutoCAD icon represent?



   (a) Arc (b) Spline (c) Polyline (d) Line

10. In AutoCAD, ---------- command is used to round the corners of a rectangle.
    (a) Break (b) Chamfer (c) Fillet (d) Extend

B

Section – B

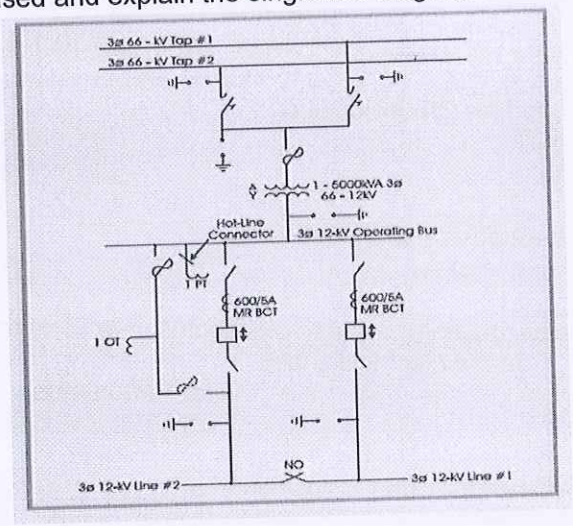
04X04 = 16 Marks

1. What do you understand by term "Electrical Drawing"?
2. Explain 2D coordinate with respect to AutoCAD.
3. What are the advantages and disadvantages of CAD software?
4. What are different methods to draw a circles in the AutoCAD? Explain with example.

Section – C

04X06 = 24 Marks

1. Find the distance and mid points between the points (−3,−1) and (2,3).
2. Draw standard symbols commonly used in electrical drawings-
   (a) Air Circuit Breaker
   (b) Fuse Cutout
   (c) Double-Throw Switch
3. What do you understand by blueprints? Write different types of blueprint and explain any two.
4. Identify the symbol used and explain the single line diagram of a substation.



Answer Key Set – B
Course Code: ELE1102, Course Name: Electrical Drawing
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, I Semester, End-Sem. Examination

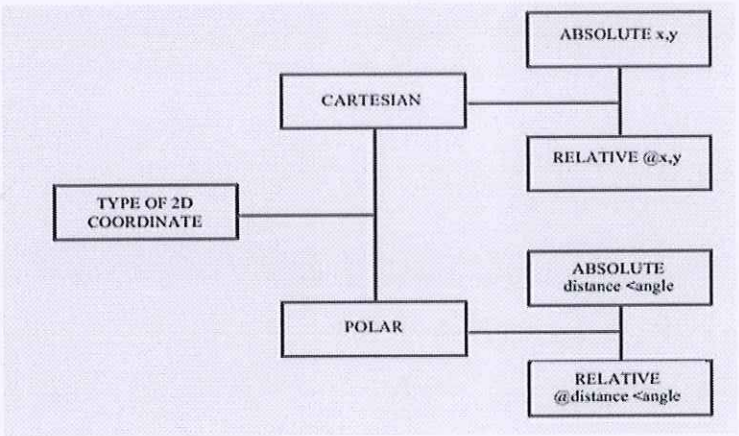
Section – A

1. (d) Size of sheet
2. (b) 1:2
3. (b) Continuous thin
4. (b) A1
5. (c) Electrical
6. (a) 0, 0, 0
7. (b) Ortho
8. (d) Depend on object
9. (c) Polyline
10. (c) Fillet

Section-B

1. Electrical drawings are the representation of electrical components and connected wiring to fulfill a specific purpose. An electrical drawing can be of a house, industry or an electrical panel.

2.



3. Advantages-

> Engineering drawing is an interactive process and when it is performed on drawing boards and includes their documentation, it is quite a time consuming process. Today in the Era of rapid technologies, product innovations, greater response to customer requirements, CAD gives an innovative and efficient system for design.
>
> CAD has the following advantages over the traditional method of design:
>
> (i) CAD is faster and give more accurate results than conventional methods.
>
> (ii) Developing the design of a component and associated drafting is a very easy task with CAD.

(iii) Kinematic feature of CAD pakages enables the designer to visualize the operational performance of the component.
(iv) Two or more designs can be compared analytically
(v) Improved productivity in drafting.
(vi) Shorter preparation time for drawing
(vii) Reduce manpower requirements.
(viii) Modifications according to customers in drawing are easier.
(ix) Improved accuracy of drawing.
(x) Revisions are possible.
(xi) Colour can be used to customize the product.
(xii) Hatching of all sections with different filling patterns.

Disadvantages-

⇒ The following limitations are experienced in the use of CAD systems:-

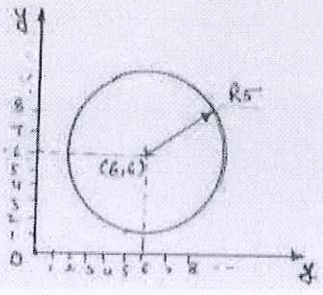
1. 64-bit word computer is nessesary because of large amount of computer memory and time.
2. The size of the software pakage is large.
3. Skill and judgment are required to prepare the drawing.
4. It requires large investment.
5. Every new release of CAD software, operator has to update their skills.

4.

1. Using Centre and Radius :-

⇒ Draw a circle with centre (6,6) and radius 5 units :-

Command : CIRCLE
3P/2P/TTR/<center point> : 6,6
Diameter / <Radius> : R
Radius : 5



2. using center and Diameter :-

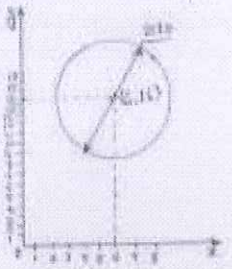
▷ Draw a circle with center (4,8) and diameter 10 units

Command : CIRCLE

3P/2P/TTR/[center point] : 4,8

Diameter/[radius] : D

Diameter : 10



3. using three points given (3P) :-

▷ Draw a circle using the given 3 points : (5,10), (4,14), (8,11) by entering 3 given points to be on the circumference of the circle.

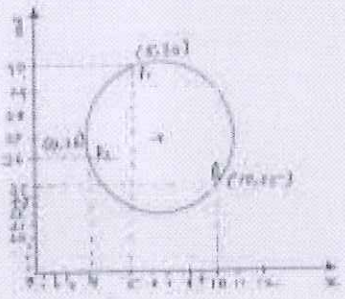
Command : CIRCLE

3P/2P/TTR/[center point] : 3P

First point : 5,10

Second point : 4,14

Third point : 10,15



4. using Two points given (2P) :-

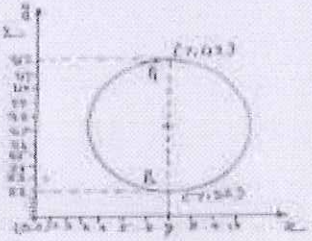
▷ Draw a circle using the given 2 points : (7,12), (7,03) by entering two endpoints of the circle diameter

Command : CIRCLE

3P/2P/TTR/[center point] : 2P

First point on diameter : 7,12

Second point on diameter : 7,03



5. using Tangent, Tangent and Radius (TTR) :-

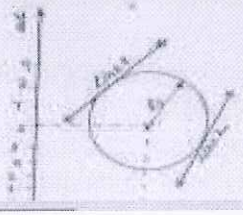
▷ Command : CIRCLE

3P/2P/TTR/[center point] : TTR

Enter Tangent specification : Line 1 (pickup using mouse)

Enter second tangent specification : Line 2 (pickup using mouse)

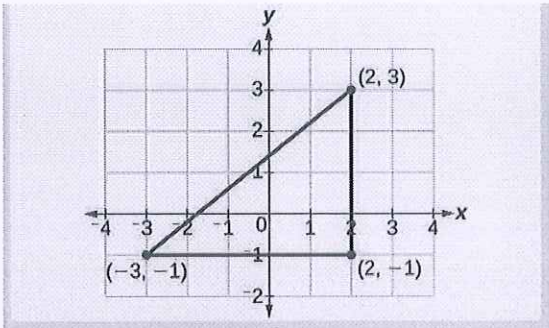
Radius : 3



Section – C

04X06 = 24 Marks

1.



Then, calculate the length of d using the distance formula.

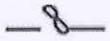
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(2 - (-3))^2 + (3 - (-1))^2}$$
$$= \sqrt{(5)^2 + (4)^2}$$
$$= \sqrt{25 + 16}$$
$$= \sqrt{41}$$

Use the formula to find the midpoint of the line segment.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{7+9}{2}, \frac{-2+5}{2}\right)$$
$$= \left(8, \frac{3}{2}\right)$$

2. (a) Air Circuit Breaker

(b) Fuse Cutout



(c) Double-Throw Switch

3. A blueprint is a photographic print of a prepared drawing with the lines and lettering in white on a bright blue background; it's used for mechanical, electrical, and architectural drawings. We will use the terms blueprint, drawing, and prints interchangeably to talk about the documents used to convey electrical information. Designers use blueprints and sketches to communicate architectural and engineering details of construction projects to the owners, constructors, operators, and decision makers.

(a) Electrical Construction Drawings: It show the physical arrangement of specific electric apparatus or their parts, including shape and dimensions.

The wiring necessary for connection to the power source is generally shown.

These drawings give all the plans, elevations, sections, and details necessary to erect a structure.

They indicate how the structure will look when it's erected.
In other words, these drawings give the complete physical information for installing or erecting the equipment.
(b) Schematic or Wiring Diagrams: Drawings that show connections of electric devices, mostly indicated by symbols, are electrical schematic or wiring diagrams.
Schematic diagrams indicate the basic electrical connections of the equipment without regard to the physical size of, or the physical relationship to, other pieces of the equipment.
A wiring diagram, besides showing the electrical connections, givesadditional information about the equipment used.
The internal circuits and/or components are shown to provide clarification of equipment operation.
Special types of wiring diagrams include one-line, or single-line, diagrams; three-line, or complete, diagrams; ladder diagrams; switchgear; and panel wiring diagrams.

- One-line diagram
- Three-line diagram
- Ladder diagram

(c) Panel and Switchgear Drawings
(d) Bill of Material
(e) Schedules

- Panels
- Light fixture
- Motor
- Conduit and cable

(f) Lighting and Power Plans

- Lighting
- Power
- Ancillary system

4. Two paralleled three-phase 66-kV power sources supply the substation. Each three-phase power source has a hand-operated air-break switch. Lightning arresters are located at the connection point of the air-break switches. The 66-kV supply powers the 3-phase, 5000-kVA (kilovoltamperes), 66- to 12-kV transformer through a fused disconnect switch. The 12-kV side has lightning arresters, and goes to a 12-kV operating bus. Two feeders are tapped from the 12-kV operating bus. An oil circuit breaker (OCB) protects each feeder. There are single-throw switches on both sides of the OCBs, to enable isolation of each OCB for maintenance. Also tapped off the operating bus is one operating transformer (OT), which can also be transferred to the other side of the OCB. A potential transformer (PT) is tapped off the operating bus with a hot-line connector. The PT provides voltage measurement in the substation. Each OCB has current transformers (CTs) on the operating bus side used to measure current and connected to the protective relaying in the substation (not shown on the one-line diagram). The 12-kV lines each have lightning arresters on the line side of the OCBs. A normally open load-break disconnect switch is connected between the two feeders. This connection enables a supply to either line or both lines from one or the other breakers.

Reg. No. _____

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End -Sem. Examination

Course Code: ELE1103 **Time: 2 Hours**

Course Name: Basic Electrical Engineering **Max. Marks: 50**

Instructions: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10x01 = 10 Marks

1. The unit of magnetic flux is:
   (a) Henry (b) Weber (c) ampere turn/ weber (d) ampere/metre

2. Permeability in magnetic circuit corresponds to ----------in electrical circuit.
   (a) Resistance (b) resistivity (c) conductivity (d) conductance

3. The property of a material which opposes the creation of magnetic flux in it is known as:
   (a) Reluctivity (b) magneto motive force (c) permeance (d) reluctance

4. Two resisters of resistance R1 and R2 are connected in series the equivalent resistance (R) is:
   (a) R= R1+R2 (b) R=(R1R2)/(R1+R2)
   (c) R=(R1+R2)/(R1R2) (d) none of these

5. Current is said to be alternating when it changes in:
   (a) Magnitude only (b) Direction only
   (c) Both Magnitude and direction (d) None of these

6. In a three phase AC circuit, the sum of all three generated voltages is:
   (a) Infinite (∞) (b) Zero (0) (c) One (1) (d) None of these

7. In a three phase, delta connection ——-
   (a) line current is equal to phase current (b) Line voltage is equal to phase voltage
   (c) Line voltage and line current is zero (d) None of these

8. Which of the following defines the Mass number of an atom?
   (a) number of protons + number of electrons
   (b) number of neutrons + number of electrons
   (c) number of protons + number of neutrons
   (d) number of electrons

9. Which of the following is not a fundamental particle of Atom?
   (a) Proton (b) Neutron (c) Alpha particle (d) Electron

10. Reciprocal of reluctance is:
    (a) Reluctivity (b) Permeance (c) Permeability (d) Susceptibility

A

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Section – B

04x04 = 16 Marks

1. What do you mean by Electric Power?
2. State and explain Krichhoff's Voltage Law?
3. What are the Advantages of 3 phase system over the 1 phase system?
4. Three resistance 50 ohms, 100 ohms and 200 ohms are connected in parallel to a 250V supply. Determine the current flowing through each resistor.

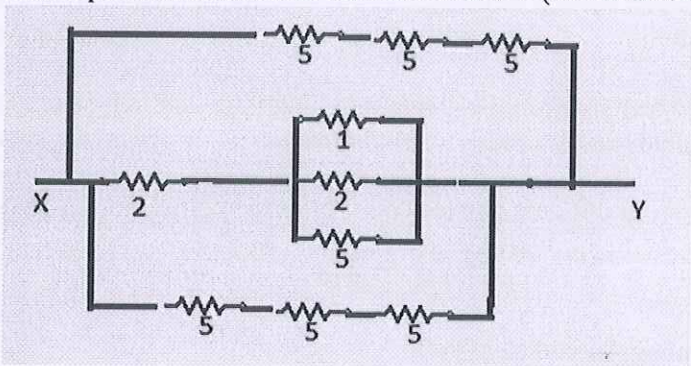
Section – C

04x06 = 24 Marks

1. Draw a sine wave and explain following:

   a. Cycle b. Time period c. Frequency

2. Find the equivalent resistance between X and Y (Given all the resistances are in ohms)?



3. Explain the properties of magnetic lines of force.
4. Draw and explain the power triangle.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End -Sem. Examination

Course Code: ELE1103 **Time: 2 Hours**

Course Name: Basic Electrical Engineering **Max. Marks: 50**

Section – A

10X01 = 10 Marks

1. The unit of magnetic flux is:
   (a) Henry (b) **Weber** (c) ampere turn/ weber (d) ampere/metre
2. Permeability in magnetic circuit corresponds to ----------in electrical circuit.
   (a) Resistance (b) resistivity **(c) conductivity** (d) conductance
3. The property of a material which opposes the creation of magnetic flux in it is known as:
   (a) Reluctivity (b) magneto motive force (c) permeance **(d) reluctance**
4. Two resisters of resistance R1 and R2 are connected in series the equivalent resistance (R) is:
   (a) **R= R1+R2** (b) R=(R1R2)/(R1+R2)
   (c) R=(R1+R2)/(R1R2) (d) none of these
5. Current is said to be alternating when it changes in
   (a) Magnitude only (b) Direction only
   (c) Both Magnitude and direction (d) None of these
6. In a three phase AC circuit, the sum of all three generated voltages is _____ ?
   (a) Infinite (∞)
   (b) Zero (0)
   (c) One (1)
   (d) None of the above
7. In a three phase, delta connection ——-
   (a) line current is equal to phase current
   (b) Line voltage is equal to phase voltage
   (c) None of the above
   (d) Line voltage and line current is zero

8. Which of the following defines the Mass number of an atom?
   (a) number of protons + number of electrons
   (b) number of neutrons + number of electrons
   (c) **number of protons + number of neutrons**
   (d) number of electrons

9. Which of the following is not a fundamental particle of Atom ?
   (a) Proton (b) Neutron (c) **Alpha particle** (d) Electron

10. Reciprocal of reluctance is
    (a) Reluctivity
    (b) Permeance
    (c) Permeability
    (d) Susceptibility

Section – B

04X04 = 16 Marks

1. What do you mean by Electric Power?
   Ans: Electric power is the rate of energy consumption in an electrical circuit.
   Electric power is the rate at which energy is transferred to or from a part of an electric circuit
   The electric power is measured in units of watts.
   General form:
   electric power = Potential difference x current
   P = VI

2. State and explain Krichhoff's Voltage Law?
   Ans: KVL states that the algebraic sum of the voltages between successive nodes in a closed path in a circuit is equal to zero
   Or
   Algebraic sum of all the voltages in a closed electrical circuit is equal to zero.

3. What are the Advantages of 3 phase system over the 1 phase system?

Answer: The advantages of polyphase system over single phase systems are given below:

a) Power delivered is constant. In single phase circuit the power delivered is pulsating and objectionable for many applications.
b) For a given frame size a polyphase machine gives a higher output than a single phase machine.
c) Polyphase induction motors are self starting and are more efficient. Single phase motor has no starting torque and requires an auxiliary means for starting.
d) Comparing with single phase motor, three phase induction motor has higher power factor and efficiency.
   Three phase motors are very robust, relatively cheap, generally smaller, have self-starting properties, provide a steadier output and require little maintenance compared with single phase motors.
e) For transmitting the same amount of power at the same voltage, a three phase transmission line requires less conductor material than a single phase line. The three phase transmission system is so cheaper.
   For a given amount of power transmitted through a system, the three phase system requires conductors with a smaller cross-sectional area.
   This means a saving of copper and thus the original installation costs are less.
f) Polyphase motors have uniform torque whereas most of the single phase motors have pulsating torque.
g) Parallel operation of three-phase generators is simpler then that of single phase generator.
h) Polyphase system can set up rotating magnetic field in stationary windings.

4. Three resistance 50 ohms, 100 ohms and 200 ohms are connected in parallel to a 250V supply. Determine the current flowing through each resistor.
   Ans: R1=50 R2=100 R3=200
   Since it is a parallel circuit the voltage across all the resistor is same.
   Thus,
   250=50*I1
   I1=5 A

Current through 50 ohm resistor is 5A
250=100*I2
I2=2.5
Current through 100 ohm resistor is 2.5A
250=200*I3
I3=1.25
Current through 200 ohm resistor is 1.25A

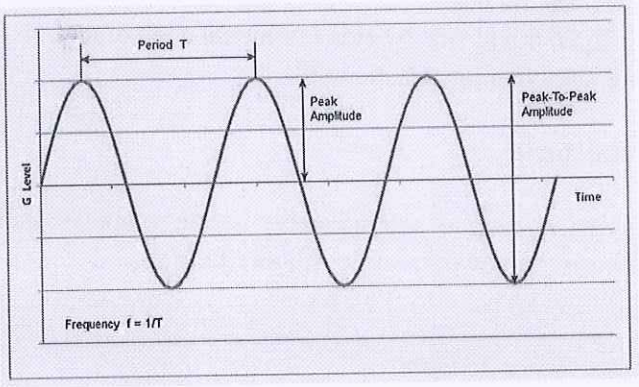
Section – C

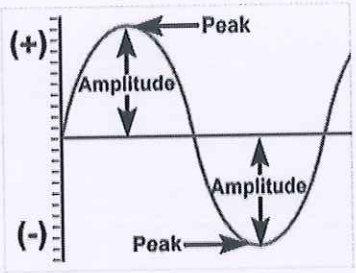
04X06 = 24 Marks

1. Draw a sine wave and explain following

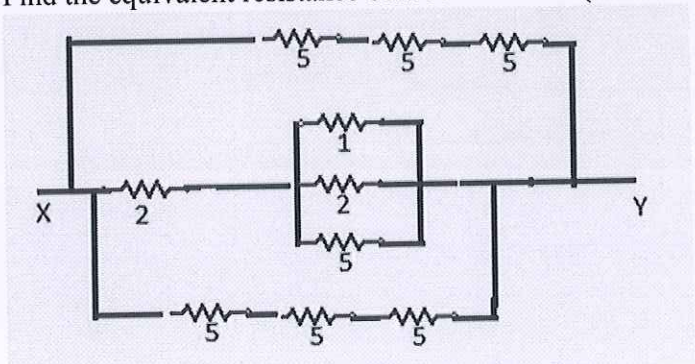
a. Cycle b. Time period c. Frequency

Ans: Cycle: One complete wave of alternating current or voltage.
Time Period (T): The time required to produce one complete cycle of a waveform
Frequency (f): is equal to number of cycles per second.
f=1/T





2. Find the equivalent resistance between X and Y (Given all the resistances are in ohms)?

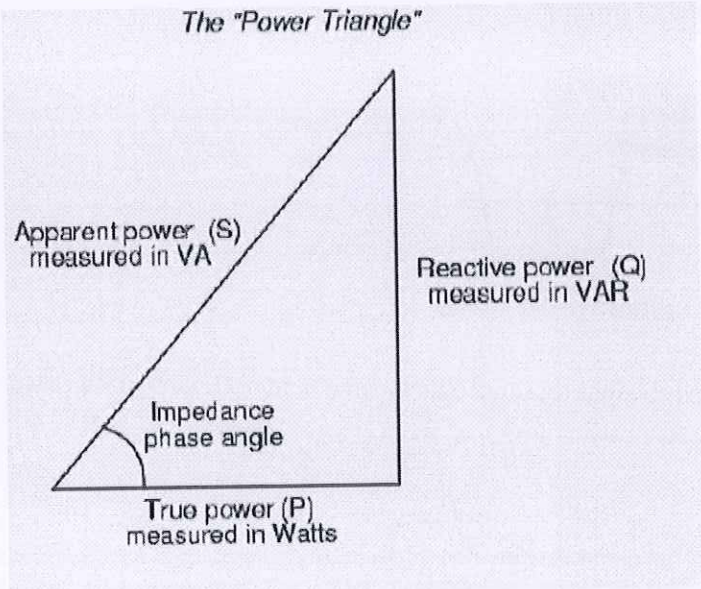


RT1= 5+5+5 =15

RT2=5+5+5 =15
1/RT3=1/1+1/2+1/5
1/RT3=1+.5+.2
1/RT3=1.7
RT3=0.588
RT4=2+0.588 =2.588
1/Rtotal =[1/15+1/15+1/2.588]
1/Rtotal=0.519732
Rtotal=1.924068

3. Explain the properties of magnetic lines of force.
Ans: • Magnetic flux of a filed is considered as the total number of magnetic lines of force in the field. These are also called magnetic flux lines.
   - Each magnetic flux line is closed loop.
   - Each magnetic flux line starts from north pole of a magnet and comes to the south pole through the field and continues from south pole to north pole in the body of the magnet.
   - No two flux lines cross each other.
   - Two similar lines of force travel side by side but repeal each other.
   - The lines of force are stretched like elastic cord.

4. Draw and explain the power triangle.
The Power Triangle
These three types of power—true, reactive, and apparent—relate to one another in trigonometric form. We call this the power triangle: (Figure below).



Reg. No. _____

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End -Sem. Examination

Course Code: ELE1103 **Time: 2 Hours**

Course Name: Basic Electrical Engineering **Max. Marks: 50**

Instructions: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. Equivalent resistance for a parallel circuit is: -
   (a) $R=R_1+R_2$ (b) $R=1/(R_1+R_2)$ (c) $1/R= 1/R_1 + 1/R_2$ (d) $R= R_1xR_2$

2. An electric current is the:
   (a) Random movement of electrons in a conductor
   (b) Flow of electrons
   (c) Pressure difference between two poles
   (d) The power that causes drift of electrons

3. Basic source of magnetism is:
   (a) Charged particles alone (b) Movement of charged particles
   (c) Magnetic dipoles (d) Magnetic domains

4. Unit of magnetic flux density is:
   (a) Wb /m^2 (b) Wb/A.m (c) A/m (d) Tesla/m

5. Unit of resistivity is:
   (a) Ohm (b) Ohm-meter (c) Ohm-$meter^2$ (d) Ampere

6. Which relation defines Ohm's law from the following: -
   (a) Voltage α 1/Current (b) Current α Voltage
   (c) Both a and b (d) None of these

7. Which of the following quantities consists of SI units as watt?
   (a) Force (b) Charge (c) Power (d) Current

8. The sum of the incoming currents at a junction is equal to sum of the _____.
   (a) Incoming currents (b) Outgoing currents
   (c) Incoming voltage (d) Outgoing voltage

9. In a three phase, star connection ——-
   (a) line current is equal to phase current (b) Line voltage is equal to phase voltage
   (c) Line voltage and line current is zero (d) None of these

10. Which of the following is not a fundamental particle of Atom?
    (a) Proton (b) Neutron (c) Alpha particle (d) Electron

B

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Section – B

04X04 = 16 Marks

1. State and explain Kirchhoff's current law.
2. What is an electric circuit? Distinguish between an open and a closed circuit.
3. Why Three Phase is preferred over Single Phase?
4. What are the limitations of Ohms law?

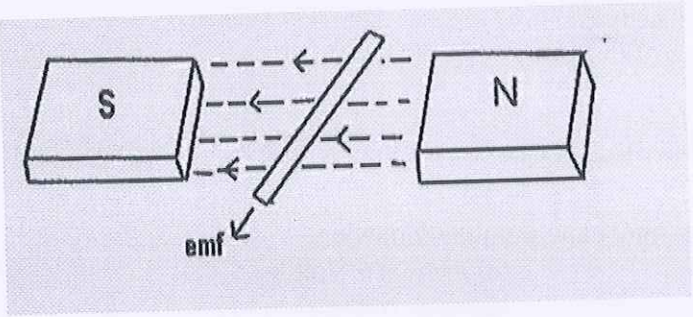
Section – C

04X06 = 24 Marks

1. Complete the following table for a circuit consisting of a voltage source connected in series with resistance?

	Voltage (V)	Current (A)	Power (w)	Resistance (ohm)
1.	100			1000
2.	500	20		
3.		10	1000	

2. Explain Faraday's law of electromagnetic induction?



3. Distinguish between Magnetic and Electrical circuits.
4. Draw and explain the power triangle.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
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Course Name: Basic Electrical Engineering **Max. Marks: 50**

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    (a) Proton (b) Neutron (c) **Alpha particle** (d) Electron

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

04X04 = 16 Marks

1. State and explain Kirchhoff's current law.

   Answer: The algebraic sum of current meeting at an junction in a circuit is zero. In this law, the current flowing towards the junction are considered as +ve and those flowing away from the junction as −ve currents.
   As shown in the figure, we have
   $i1-i2-i3+i4-i5=0$
   or $i1+i4=i2+i3+i5$

2. What is an electric circuit? Distinguish between an open and a closed circuit.
   Answer. An arrangement for maintaining the continuous flow of electric current by the electrical energy source through the various electrical components connected with each other by conducting wires is termed as electric circuit.
   An open circuit does not carry any current, while a closed circuit carries current.

3. Why Three Phase is preferred over Single Phase?
   Answer:
   The advantages of polyphase system over single phase systems are given below:

a) Power delivered is constant. In single phase circuit the power delivered is pulsating and objectionable for many applications.
b) For a given frame size a polyphase machine gives a higher output than a single phase machine.
c) Polyphase induction motors are self starting and are more efficient. Single phase motor has no starting torque and requires an auxiliary means for starting.
d) Comparing with single phase motor, three phase induction motor has higher power factor and efficiency.
   Three phase motors are very robust, relatively cheap, generally smaller, have self-starting properties, provide a steadier output and require little maintenance compared with single phase motors.
e) For transmitting the same amount of power at the same voltage, a three phase transmission line requires less conductor material than a single phase line.
   The three phase transmission system is so cheaper.
   For a given amount of power transmitted through a system, the three phase system requires conductors with a smaller cross-sectional area.
   This means a saving of copper and thus the original installation costs are less.
f) Polyphase motors have uniform torque whereas most of the single phase motors have pulsating torque.
g) Parallel operation of three-phase generators is simpler then that of single phase generator.
h) Polyphase system can set up rotating magnetic field in stationary windings.

4. What are the limitations of Ohms law?
   Answer: The limitations of Ohm's law are outlined below:

   This law cannot be applied to unilateral networks.

A unilateral network has unilateral elements like diode, transistors, etc., which do not have same voltage current relation for both directions of current.
Ohm's law is also not applicable for non – linear elements.
Non-linear elements are those which do not have current exactly proportional to the applied voltage, that means the resistance value of those elements changes for different values of voltage and current. Examples of non – linear elements are thyristor, electric arc, etc.

Section – C

04X06 = 24 Marks

1. Complete the following table for a circuit consisting of a voltage source connected in series with resistance?

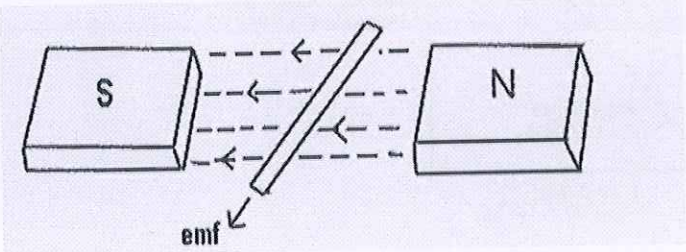
	Voltage (V)	Current (A)	Power (w)	Resistance (ohm)
1.	100			1000
2.	500	20		
3.		10	1000	

Ans

1. V=100
   R=100
   Then I= 100/1000
   0.1
   P=V*I=.1*100=10
2. P=500*20=10000
   R=V/I=500/20=25
3. P=1000
   I=10
   1000=10^2*R
   R=1000/100=10
   V=I*R
   V=10*10

	Voltage (V)	Current (A)	Power (w)	Resistance (ohm)
1.	100	0.1	10	1000
2.	500	20	1000	25
3.	100	10	1000	10

2. Explain Faraday's law of electromagnetic induction?



Ans: Faraday's First Law:
Whenever a conductor is placed in a varying magnetic field an EMF gets induced across the conductor (called as induced emf), and if the conductor is a closed circuit then induced current flows through it.
Magnetic field can be varied by various methods -
1. By moving magnet
2. By moving the coil
3. By rotating the coil relative to magnetic field

Faraday's Second Law:
Faraday's second law of electromagnetic induction states that, the magnitude of induced emf is equal to the rate of change of flux linkages with the coil. The flux linkages is the product of number of turns and the flux associated with the coil.

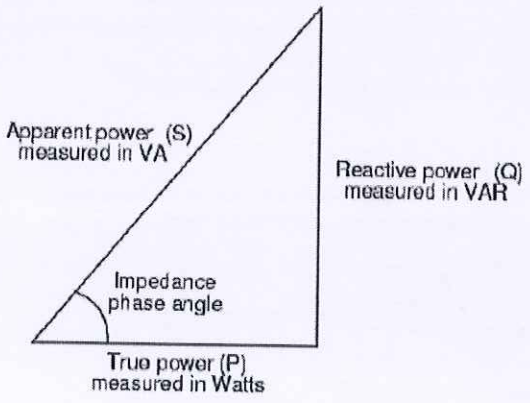
3. Distinguish between Magnetic and Electrical circuits.

Electric Circuit	*Magnetic Circuit*
1. E.M.F. in volts	1. M.M.F. in Ampere Turns
2. Current in Amperes	2. Flux in Webers
3. Resistance in Ohms $R = \frac{\rho l}{a}$	3. Reluctance in AT/Wb $S = \frac{l}{a\mu}$
4. Conductivity $= \left(\frac{1}{\text{resistivity}}\right)$	4. Permeability $= \left(\frac{1}{\text{reluctivity}}\right)$
5. Conductance $= \left(\frac{1}{\text{resistance}}\right)$	5. Permeance $= \left(\frac{1}{\text{reluctance}}\right)$
6. Current $= \left(\frac{\text{e.m.f.}}{\text{resistance}}\right)$	6. Flux $= \left(\frac{\text{M.M.F.}}{\text{reluctance}}\right)$
7. Resistivity	7. Reluctivity

4. Draw and explain the power triangle.

The Power Triangle
These three types of power—true, reactive, and apparent—relate to one another in trigonometric form. We call this the *power triangle*: (Figure below).

The "Power Triangle"



Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End-Sem. Examination

Course Code: ELE1104 **Time: 2 Hours**
Course Name: Maintenance Technician Electrical **Max. Marks: 50**
Instruction: All questions are compulsory. Each question carries one mark in section A, four marks in section B and six marks in section C. Scientific calculator is allowed.

Section – A

10x01 = 10 Marks

1. PPE stands for:
   (a) Personal Protective Equipment
   (b) Professional Protective Equipment
   (c) Personal Professional Equipment
   (d) Professional Personal Equipment
2. 5s is a:
   (a) Principle (b) Rule (c) Law (d) both b and c
3. Eye PPE protects from:
   (a) Chemical Exposure
   (b) Laser Exposure
   (c) Welding Light Exposure
   (d) All of the above
4. _____ is used for face protection as PPE.
5. _____ are used for hand protection as PPE.
6. The rating of an electric iron is expressed in:
   (a) KW
   (b) KWh
   (c) KVA
   (d) HP
7. Unit of frequency is:
   (a) Second
   (b) Cycle
   (c) Hertz
   (d) Weber
8. Full form of ELCB is:
   (a) Earth Leakage Circuit Breaker
   (b) Earth Linear Circuit Breaker
   (c) Earth Leakage Current Breaker
   (d) Earth Linear Current Breaker
9. What are the benefits of 5s to an organization?
   (a) Improved Safety
   (b) Increased Profitability
   (c) Increased Efficiency
   (d) All of the above
10. The capacity of an air conditioner is expressed in:
    (a) KWh
    (b) Tons
    (c) KVA
    (d) KVAR

Section – B

04x04 = 16 Marks

1. Explain any 4s Principles.
2. What is PPE. Why is it important?
3. Write different types of PPE used for eyes.
4. Draw any eight symbols with their names used in electrical drawings/schematics.

Section – C

04x06 = 24 Marks

1. List the various reasons for defects in electric iron.
2. List any six advantages of 5s principle.
3. Explain autonomous maintenance. Write any four advantages of autonomous maintenance.
4. Write the various preventive maintenance checklist points.

A

Set-A

School of Electrical Skills
Session: 2020-21 (Summer Semester)
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End-Sem. Examination

Course Code: ELE 1104
Course Name: Maintenance Technician Electrical **Max. Marks: 50**

Section – A

10x01 = 10 Marks

Ans. 01: (a)
Ans. 02: (a)
Ans. 03: (d)
Ans. 04: (Face Shield)
Ans. 05: (Gloves)
Ans. 06: (a)
Ans. 07: (c)
Ans. 08: (a)
Ans. 09: (d)
Ans. 10: (b)

Section – B

04x04 = 16 Marks

Ans. 1: - 1. Sorting:
"Sorting" means to sort through & separate everything in each work area. Keep only what is necessary. Materials, tools, equipment and supplies that are not frequently used should be moved to a separate, common storage area.

- Eliminate all unnecessary tools, parts, and instructions.
- Keep only essential items and eliminate what is not required.
- Prioritizing things per requirements and keeping them in easily-accessible places.
- Everything else is stored or discarded.

2. Straightening or setting in order:
Once you have completed the sort step, the workplace should be free from clutter and unnecessary items. Now it is time to straighten everything up and organize it. The goal is to put everything in its place and organize each workstation for maximum efficiency and productivity.

- There should be a place for everything and everything should be in its place.
- The place for each item should be clearly labelled.
- Items should be arranged in a manner that promotes efficient work flow, with equipment used most often being the most easily accessible.

3. Shining or Systematic Cleaning:
Systematic cleaning is done for clean the unwanted things from the work place. Shining is done at the end of each shift, clean the work area and be sure everything is restored to its place.

- Clean the workspace and all equipment, and keep it clean, tidy and organized.
- At the end of each shift, clean the work area and be sure everything is restored to its place.
- Maintaining cleanliness should be part of the daily work – not an occasional activity initiated when things get too messy.

4. **Standardizing:** Implement color coding and labels to stay consistent with other areas.

- All work stations for a particular job should be identical.
- All employees doing the same job should be able to work in any station with the same tools that are in the same location in every station.
- Everyone should know exactly what his or her responsibilities are for adhering to the first 3 S's.

5. **Sustaining the discipline or self-discipline:**

Discipline and training imposed upon a person. Children are taught by their parents to brush their teeth after every meal.

- Maintain and review standards.
- Maintain focus on this new way and do not allow a gradual decline back to the old ways.
- While thinking about the new way, also be thinking about yet better ways.

Ans. 2: -

PPE is abbreviation used for Personal Protective Equipment. It is important for the safety of people working in industries where they can get harmed physically.

- Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly.
- Even where engineering controls and safe systems of work have been applied, some hazards might remain. These include injuries to:
    - the lungs, e.g., from breathing in contaminated air
    - the head and feet, e.g., from falling materials
    - the eyes, e.g., from flying particles or splashes of corrosive liquids
    - the skin, e.g., from contact with corrosive materials
    - the body, e.g., from extremes of heat or cold

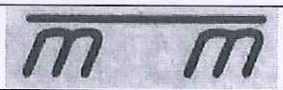
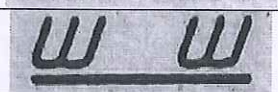
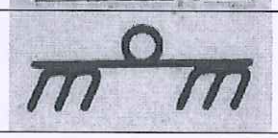
PPE is needed in these cases to reduce the risk

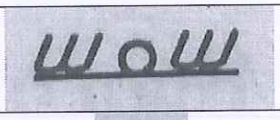
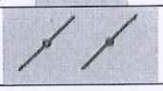
Ans. 3: -

Different types of PPE used for eye are:

- Non-Prescription safety glasses.
- Prescription safety glasses.
- Employees that wear prescription (Rx) lenses can use non-prescription eye protection worn over prescription lenses as long as it does not compromise the fit of either piece of eyewear.
- Goggles
- Chemical
- Laser
- Welding
- Chemical goggles protect your eyes, eye sockets, and the facial area immediately surrounding the eyes from impact, dust, and splashes.
- Chemical goggles are generally stronger than safety glasses and are used for higher impact, particle and chemical splash protection.
- Laser and Welding goggles protect the eyes from harmful light.

Ans. 4: -

Sr. no.	Name	Symbols used in circuit diagrams	Symbols used in layout
1	General wiring	N.A.	
2	Wiring on the surface	N.A.	
3	Wiring under the surface	N.A.	
4	Conduit on the surface	N.A.	

5	Conduit under the surface	N.A.	
6	Wiring going upward	N.A.	
7	Wiring going downward	N.A.	
8	Wiring passing vertically through a room	N.A.	

Section – C

06x04 = 24 Marks

Ans. 1: -

Serial No	Trouble	Possible Cause	Corrective action to be taken
1	No Heat	• No Power at outlet. • Defective cord or plug • Loose terminal connections • Broken lead in iron • Loose thermostat control knob • Defective heater element • Open terminal fuse	• Check outlet for power • Repair or replace • Check and tighten. • Repair or replace of lead • Clean and tighten • Replace the element if separate. If cast in, replace sole-plate assembly • Replace
2	Insufficient Heat	• Low line voltage. • Incorrect thermostat setting • Defecting thermostat • Loose connection	• Check voltage at outlet. • Adjust and recalibrate thermostat. • Replace thermostat. • Clean and tighten connections
3	Excessive Heat	• Incorrect thermostat setting • Defective thermostat	• Adjust and recalibrate thermostat or replace • Replace thermostat
4	Iron gives shock	• Loose connection. • Broken wire • Disconnected earth connection. • Weak insulation or heating element. • Earth continuity with common earth not available	• Clean and tighten • Repair or replace • Check earth connection and connect properly. • Check insulation resistance of heating element; If necessary, replace element • Check the main earth continuity and connect properly

Ans. 2: -

1. Improves organizational efficiency
2. Reduces waste in all forms
3. Cuts down employee frustration when "the system doesn't work"
4. Improves speed and quality of work performance

5. Improves safety
6. Creates a visually attractive environment

Ans. 3: -

Autonomous Maintenance: Autonomous Maintenance follows a structured approach to increase the skill levels of personnel so that they can understand manage and improve their equipment and processes.

Standards are introduction for cleaning, inspection, tightening and lubrication to ensure the conditions are sustained.

In many production or processing plants operators and technicians have some form of technical education such as a trade in machinery, electrician, or tooling technician and in larger organizations these positions are entry level positions for graduate engineers. This is beneficial as qualified operators have a much better understanding of fixed plant machinery, engineering design, plant maintenance procedures and are much better at troubleshooting production problems.

Advantages of Autonomous Maintenance:

1. Increase in productivity and Overall Plant Efficiency by 1.5 or 2 times.
2. Customer complaints are rectified swiftly.
3. Accidents are reduced considerably.
4. Total productive Management ensures higher confidence level among the employees.
5. Better upkeep of the work place by making it clean, neat and attractive.
6. Favorable change in the attitude of the operators.
7. Reduction in total manpower.
8. AM ensures better and more energy saving measures and also better safety of men and machine as all concerned people know well about the equipment and those devices.

Ans. 4: -

1. All Lights Working
2. Glassware conditions
3. Fixture support conditions
4. Wiring Conditions
5. Ballast Conditions
6. Siren/Timer Conditions
7. JB Cover conditions
8. Switch Conditions
9. Outlet Cord Conditions
10. Protective caging conditions
11. Security Cameras working properly
12. Proper viewing angle of security cameras

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End-Sem. Examination

Course Code: ELE1104 **Time: 2 Hours**
Course Name: Maintenance Technician Electrical **Max. Marks: 50**
Instruction: All questions are compulsory. Each question carries one mark in section A, four marks in section B and six marks in section C. Scientific calculator is allowed.

Section – A

10x01 = 10 Marks

1. Which of the following is used for hammering soft materials?
   (a) Ball Peen Hammer (c) Chisel
   (b) Mallet (d) None of the above

2. The tool used for removing fine amounts of material from a workpiece is called:
   (a) File (c) Handsaw
   (b) Chisel (d) None of these

3. Combination plier is used for:
   (a) Twisting (b) Holding (c) Cutting (d) All of these

4. What are the benefits of 5s to an organization?
   (a) Improved Safety (c) Increased Efficiency
   (b) Increased Profitability (d) All of the above

5. The tool used for removing insulation of cables is called _____.

6. _____ are used for hand protection as PPE.

7. The rating of an electric iron is expressed in:
   (a) KW (c) KVA
   (b) KWh (d) HP

8. The tool used for checking horizontal and vertical levels of a surface or an object is called _____.

9. The capacity of an air conditioner is expressed in:
   (a) KWh (c) KVA
   (b) Tons (d) KVAR

10. Full form of MCCB is:
    (a) Miniature Current Circuit Breaker (c) Miniature Case Current Breaker
    (b) Molded Case Circuit Breaker (d) Miniature Circuit Current Breaker

Section – B

04x04 = 16 Marks

1. List any eight preventive maintenance checklist points.
2. Write different types of PPE used for hands.
3. List any four advantages of autonomous maintenance.
4. Write any four advantages of 5s principle.

Section – C

04x06 = 24 Marks

1. What is PPE. Write PPEs used for eyes and feet?
2. Draw any 12 symbols with their names used in electrical drawings/schematics.
3. List the various reasons for defects in ceiling fans.
4. Explain any 3s Principles.

B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B.Voc. Program, 1st Semester,
End-Sem. Examination

Course Code: ELE 1104
Course Name: Maintenance Technician Electrical **Max. Marks: 50**

Section – A

10x01 = 10 Marks

Ans. 01: (b)
Ans. 02: (a)
Ans. 03: (d)
Ans. 04: (d)
Ans. 05: (Wire Stripper)
Ans. 06: (Gloves)
Ans. 07: (a)
Ans. 08: (Spirit Level)
Ans. 09: (b)
Ans. 10: (b)

Section – B

04x04 = 16 Marks

Ans. 1: -

1. All Lights Working
2. Glassware conditions
3. Fixture support conditions
4. Wiring Conditions
5. Ballast Conditions
6. Siren/Timer Conditions
7. JB Cover conditions
8. Switch Conditions

Ans. 2: -

- Needed when work presents thepotential of causing hand injury from physical, chemical, or radiation agents.
- Examples of hazards:
  - Absorbing harmful substances
  - Sharp objects capable of causing cuts, abrasions, or punctures
  - Chemical or thermal burns
  - Electrical work

Types of Hand Protection:

- High/Low temperatures
- Voltage Rated
- Temperature Resistant
- Infectious Agent / Biohazard Resistant – (Latex, Vinyl, Nitrile, etc)

Ans. 3: -

1. Increase in productivity and Overall Plant Efficiency by 1.5 or 2 times.
2. Customer complaints are rectified swiftly.
3. Accidents are reduced considerably.
4. Total productive Management ensures higher confidence level among the employees.

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5. Better upkeep of the work place by making it clean, neat and attractive.
6. Favorable change in the attitude of the operators.
7. Reduction in total manpower.
8. AM ensures better and more energy saving measures and also better safety of men and machine as all concerned people know well about the equipment and those devices.

Ans. 4: -

1. Improves organizational efficiency
2. Reduces waste in all forms
3. Cuts down employee frustration when "the system doesn't work"
4. Improves speed and quality of work performance
5. Improves safety
6. Creates a visually attractive environment

Section – C

06x04 = 24 Marks

Ans. 1: - PPE is abbreviation used for Personal Protective Equipment. It is important for the safety of people working in industries where they can get harmed physically.

- Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly.
- Even where engineering controls and safe systems of work have been applied, some hazards might remain.

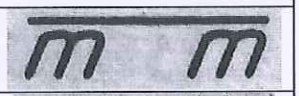
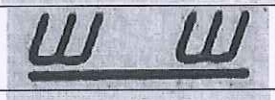
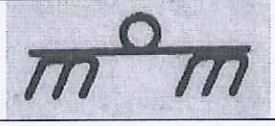
Types of eye protection include:

- Non-Prescription safety glasses.
- Prescription safety glasses.
- Employees that wear prescription (Rx) lenses can use non- prescription eye protection worn over prescription lenses as long as it does not compromise the fit of either piece of eyewear.

Types of hand protection include:

- Voltage Rated
- Temperature Resistant
- Infectious Agent / Biohazard Resistant – (Latex, Vinyl, Nitrile, etc)

Ans. 2: -

Sr. no.	Name	Symbols used in circuit diagrams	Symbols used in layout
1	General wiring	N.A.	
2	Wiring on the surface	N.A.	
3	Wiring under the surface	N.A.	
4	Conduit on the surface	N.A.	

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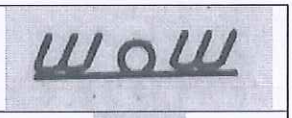
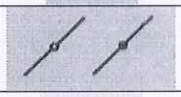
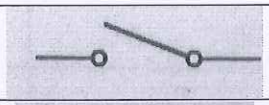
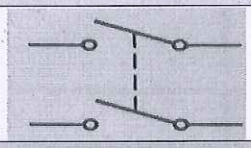
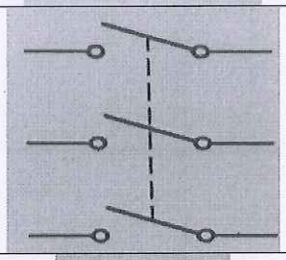
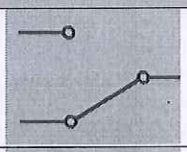
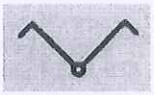
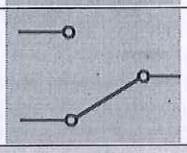
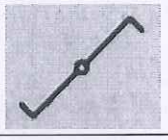
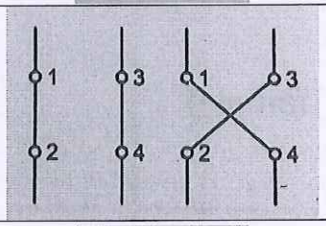
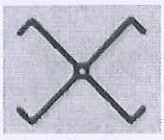
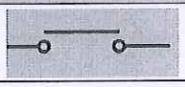
5	Conduit under the surface	N.A.	
6	Wiring going upward	N.A.	
7	Wiring going downward	N.A.	
8	Wiring passing vertically through a room	N.A.	
9	Single pole one way switch		
10	Double pole one way switch		
11	Three pole one way switch		
12	Multi-position switch		
13	Two way switch		
14	Intermediate switch		
15	Push button or bell push		

Ans. 3: -

Serial No.	Trouble	Possible cause	Corrective action to be taken
1	Low Speed	• It is due to defective or leaky capacitor. • Low applied voltage	• Replace the capacitor. • Check the voltage and adjust if possible

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	Not starting	• Low applied voltage • Supply failure • Open in winding • Capacitor open and short • Open in regulator switch	• Check the voltage and adjust it, if possible • Check the supply points at switch • Check the winding continuity • Check the capacitor • Check for open or loose contact in the resistor or contact
3	Jamming of the rotor	• It is due to poor assembly lubrication	• Dismantle and assemble property after proper lubrication
4	Noise	• It is due to worn out bearing and absence of lubrication oil and grease. • Humming or induction noise is due to non-uniform air gap owing to the displacement of the rotor.	• The bearing must be replaced if worn out; otherwise, lubrication with proper lubricate with proper lubricant. • Dismantle and re=assemble properly

Ans. 4: -

1. Sorting:

"Sorting" means to sort through & separate everything in each work area. Keep only what is necessary. Materials, tools, equipment and supplies that are not frequently used should be moved to a separate, common storage area.

- Eliminate all unnecessary tools, parts, and instructions.
- Keep only essential items and eliminate what is not required.
- Prioritizing things per requirements and keeping them in easily-accessible places.
- Everything else is stored or discarded.

2. Straightening or setting in order:

Once you have completed the sort step, the workplace should be free from clutter and unnecessary items. Now it is time to straighten everything up and organize it. The goal is to put everything in its place and organize each workstation for maximum efficiency and productivity.

- There should be a place for everything and everything should be in its place.
- The place for each item should be clearly labelled.
- Items should be arranged in a manner that promotes efficient work flow, with equipment used most often being the most easily accessible.

3. Shining or Systematic Cleaning:

Systematic cleaning is done for clean the unwanted things from the work place. Shining is done at the end of each shift, clean the work area and be sure everything is restored to its place.

- Clean the workspace and all equipment, and keep it clean, tidy and organized.
- At the end of each shift, clean the work area and be sure everything is restored to its place.
- Maintaining cleanliness should be part of the daily work – not an occasional activity initiated when things get too messy.

4. **Standardizing:** Implement color coding and labels to stay consistent with other areas.

- All work stations for a particular job should be identical.
- All employees doing the same job should be able to work in any station with the same tools that are in the same location in every station.
- Everyone should know exactly what his or her responsibilities are for adhering to the first 3 S's.

5. **Sustaining the discipline or self-discipline:**

Discipline and training imposed upon a person. Children are taught by their parents to brush their teeth after every meal.

- Maintain and review standards.
- Maintain focus on this new way and do not allow a gradual decline back to the old ways.
- While thinking about the new way, also be thinking about yet better ways.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End-Sem. Examination

Course Code: ELE1105 **Time: 2 Hours**

Course Name: Electrical Safety **Max. Marks: 50**

Instruction: Please read the questions carefully and try to answer in consecutive order. Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. What is good tripping time of RCCB?
   (a) Less than 30 Sec (b) 10 Sec (c) Less than 30 mSec (d) 1 Sec
2. On Working Site, Grey helmet is for:
   (a) Engineer (b) Welder (c) Electrician (d) Site visitor
3. How many connection points does Earth Tester Have?
   (a) 1 (b) 2 (c) 3 (d) 4
4. What is the full form of SPD?
   (a) Surge protection device (b) Shutdown protection device
   (c) Shock protection device (d) Surge prevention device
5. Which tool we use for judge the quality and reliability of our work?
   (a) Inventory list (b) Check-list (c) Stock-register (d) work-permit
6. In following, which is not the part of fire detection and alarm system?
   (a) Power Supply/Batteries (b) Programing Unit
   (c) MCP (d) Detectors
7. The permitted value of a good earthing is: _____.
8. The full form of RCCB/RCD is: _____.
9. The full form of CPR is: _____.
10. The full form of LOTO is _____.

Section – B

04X04 = 16 Marks

1. Write Short Note on how we Select Proper breaker size for our Electrical circuit.
2. Explain the working principle of lightening arrester and also explain the procedure of measuring the resistance of lightening arrester.
3. What is the advantages of electrical safety inspection?
4. Explain the working of RCCB and also explain the testing procedure of RCCB through fluke taster.

Section – C

04X06 = 24 Marks

1. Explain the primary procedure, when
   a) Someone get Electrical shock
   b) Someone need artificial breathing
2. Explain the importance of earthing in electrical system also describe the plate earthing with the help of diagram.
3. Explain the Working flowchart of LOTO procedure also explain the different LOTO devices.
4. Explain the expulsion type lightening arrester with diagram and also write the properties of a lightening arrester.

A

Answer Key Set – A
Course Code: ELE 1105
Course Name: Electrical Safety
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester, End Sem. Examination

Section-A

1: C. Less than 30 mSec

2: D. Site visitor

3: D. 4

4: A. Surge protection device

5: B. Check-list

6: B. Programing Unit

7: Less than 5 ohm

8: Residual Current circuit breaker/ Residual current device

9: Cardio pulmonary resuscitation

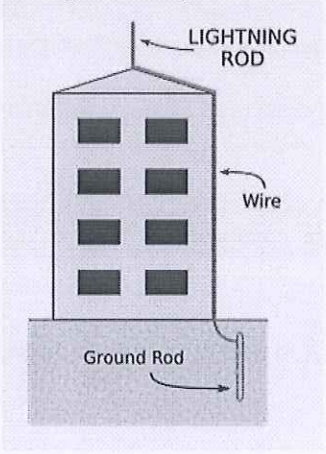
10: Lock out - Tag out

Section-B

1. Write Short Note On how we Select Proper breaker size for our Electrical circuit?
Answer- For find the Proper Size of circuit breaker we follow the following steps:

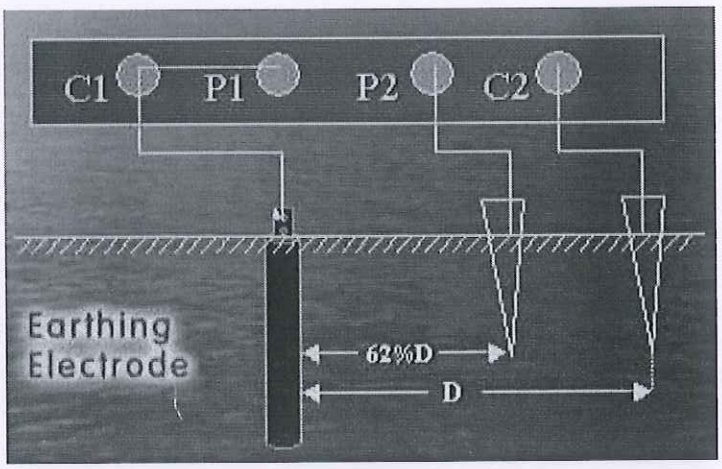
- Calculate the total connected load of our building.
- Find the running time of different loads and calculate the maximum running load of a particular time of the day. Mostly we take 40 to 70 percent of connected load as a maximum running load at a time.
- Through Maximum running load, Get the maximum current which passes through the electrical circuit.
- According to maximum current, choose what kind of breaker we need for our system. Ex. For 0 to 63 Amp current we choose MCB, for 63 to 630 Amp we choose MCCB.
- After deciding our breaker type take the nearest market available size of breaker for our circuit. Ex. Available size of MCB is 1Amp, 6Amp, 16Amp, 20Amp, 25Amp etc. so if our maximum current is 22Amp we choose 25Amp MCB for our circuit.

2. Explain the working principle of lightening arrester and also explain the procedure of measuring the resistance of lightening arrester?
Answer: - Lightning Arrester Working Principle: When a voltage surge traveling along the conductor reaches the point at which a lightning arrestor is installed it breaks down the insulation of the arrester momentarily, allowing the voltage surge to discharge to ground.
As soon as the system voltage drops below the predetermined value, insulation between the conductor and ground is restored and further current flow to ground stops.



Measuring the Earthing Resistance:

Earth Tester: The instrument used for measuring the resistance of the earth/soil is known as earth tester also called a grounding tester. It is used for sizing and projecting grounding grids.



Earth Resistance check by Earth Tester

C1 & C2 = Current terminal of earth tester.
P1 & P2 = Potential Terminals of earth tester.

- The distance of current spike from earth electrode D= 60 ft.
- Then distance of potential spike would be 62% of D = 0.62D i.e. 0.62*60= 37ft.
- In this method earth tester terminal C1 and P1 are shorted to each other and connected to the earth electrode (pipe) under test. Terminals P2 and C2 are connected to the two separate spikes driven in earth. These two spikes are kept in same line at the distance of specified length due to which there will not be mutual interference in the field of individual spikes.

when we rotate generator handle with specific speed, we get directly earth resistance on meter scale.

3. What is the advantages of electrical safety inspection?

Answer- Advantage of electrical safety inspection:

- Identify electrical wiring and components that may have degraded over time.
- Reveal if any electrical circuits are overloaded.
- Reveal if any lack of earthing.
- Identify any defective wiring or other mistakes made by non-certified electricians home-owners.
- Spot oversized fuses or breakers that may cause an electrical fire hazard.
- Find any potential electric shock risks.

4. Explain the working of RCCB and also explain the testing procedure of RCCB through fluke taster?

Answer- Residual Current Circuit Breaker (RCCB) is a differential current sensing device used to protect a low voltage circuit in case of a leakage fault. It is sometimes also known as Residual Current Device (RCD).

It is an electrical wiring device that. disconnects a circuit whenever it detects that the electric. current is not balanced between the phase conductor. When Leakage current exceed the fixed value it Disconnect the circuit.

Test of RCCB using Fluke Tester:

- Turn on the fluke test meter first. And connect probes to phase, neutral and earthing of circuit in which RCCB is connected.

- Before turning the test on make sure the circuit is in off condition because in that test we feed power in circuit and if power is already present in circuit than it will damage the circuit.
- Select the RCCB testing option in fluke tester and enter the trip current rating of RCCB trip-current rating typically 10, 30, 100, 300, 500, 1000 mA.
- Choose auto test option for test.
- Press the test button, after few seconds it measure the tripping time of RCCB.
- The tripping time of good RCCB is less than 30mSec.

Section-C

1. Explain the primary procedure, when
   A) Someone get Electrical shock
   B) Someone need of artificial breathing

Answer- A) **Electric shock:**

- Do not touch the casualty while he is still in contact with electricity.
- Switch off the current at once.
- Do not attempt first aid until the contact has been broken.
- Make the air passage clear and clean.
- Restore breathing Artificial respiration and external cardiac massage, if needed
- Call for immediate medical aid, and send the patients to the hospital.

B) **Need of Artificial Respiration:** when a person is suffering from acute breathing problem or cannot be able to breathe naturally, artificial breathing is required. It is a temporary arrangement which provides relief to the person who cannot be able to breathe properly.

Steps included in artificial Breathing:

- Mouth to Mouth this is appropriate and effective technique for emergency artificial respiration.
- Keep the head slightly backward and open the jaw.
- Seal the casualty's nose to prevent escape of air by pinching with thumb and index finger.
- Take a deep breath, open your mouth widely, place it over the victim's mouth of victim.
- Remove your mouth from the victim and allow him to exhale passively.
- Arrange immediate medical aid.

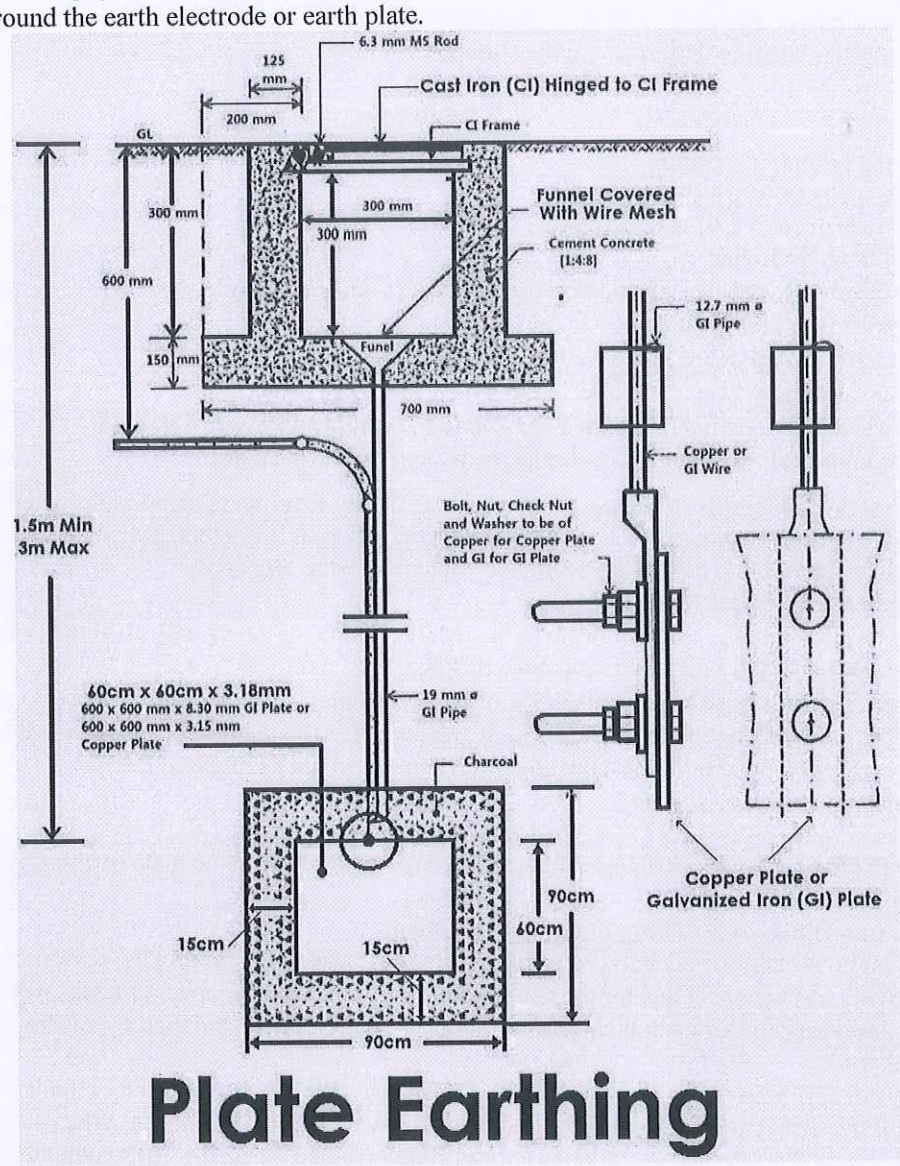
2. Explain the importance of earthing in electrical system also describe the plate earthing with the help of diagram?

Answer- **Requirement of Earthing in electrical system:**

Earthing is an important component of electrical systems because of the following reasons:

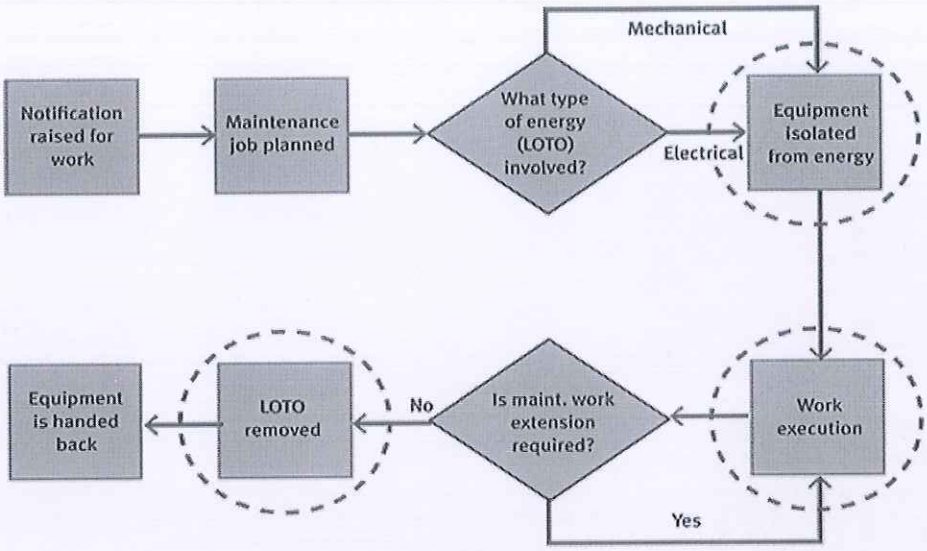
- To provide earth connections for the neutral points of transformer, capacitor banks, generators, etc. It provides path for neutral currents of three phase AC system and thereby ensure stable neutral point.
- In cases of surges in the voltage, high voltages can pass through the electricity circuit. These kinds of overload can lead to damaging of devices and danger to human life. When earthing is installed with the electrical installations, the current is routed through a different path and does not affect the electrical system.
- To ensure that overhead shielding wires of transmission lines/ outdoor yards are securely earthed so that the overhead electrical equipment's, busbars are protected from direct lightning strikes.
- It prevents damage to electrical appliances and devices by preventing excessive current from running through the circuit.
- It prevents the risk of fire that could otherwise be caused by current leakage.
- It keeps people safe by preventing electric shocks.

Plate Earthing: In plate earthing system, a plate made up of either copper with dimensions **60cm x 60cm x 3.18mm** (i.e. **2ft x 2ft x 1/8 in**) or galvanized iron (GI) of dimensions 60cm x 60cm x 6.35 mm (2ft x 2ft x ¼ in) is buried vertical in the earth (earth pit) which should not be less than 3m (10ft) from the ground level.
For proper earthing system, follow the below mentioned steps in the to maintain the moisture condition around the earth electrode or earth plate.



3. Explain the Working flowchart of LOTO procedure also explain the different LOTO devices?

Answer-



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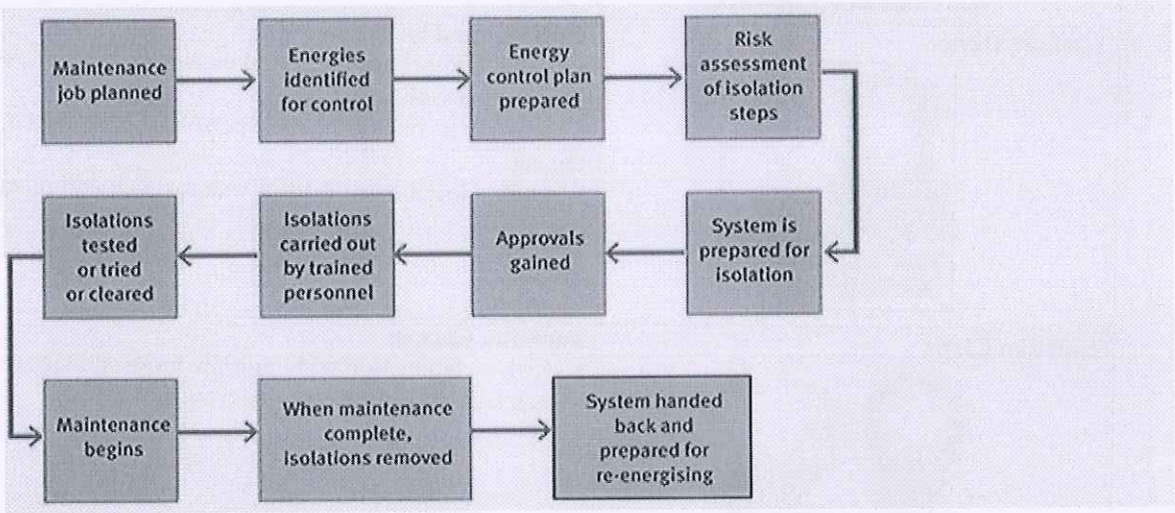
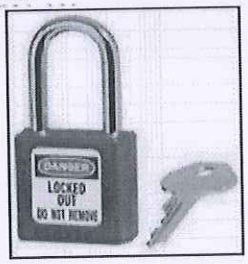
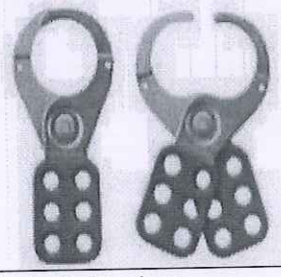


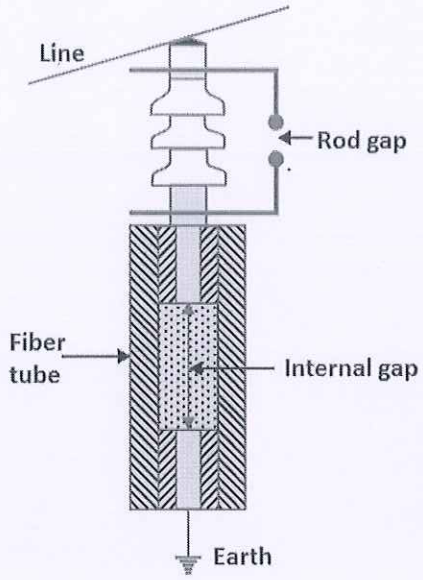
Different LOTO Devices and Their Use:

LOTO Device	Description of use
Caution Tag	**Yellow and black tag:** • Used for out of service machinery/equipment. • May be removed by appropriate service people, personnel, or supervisor after consultation and once machinery /equipment is deemed safe for repair and testing purposes. • May be used by any person to indicate a fault in machinery.

	
Danger Tag 	**Red white and black tag:** • Used to protect personnel and machinery/equipment. • May only be removed by the personnel who placed and signe the tag. • May be removed once machinery/equipment is deemed safe the individual has completed their task.
Locking Device 	**Isolation pad locks:** • Used to protect personnel and machinery/equipment in conjunction with tags. • May only be removed by the personnel who placed and signe the tag. • Multiple locks must be used; one for each individual.
Isolation Claps 	**Isolation Clasps:** • Used in conjunction with multiple locks and tags. • Each lock on a clasp represents each individual.
Physical Restrain Devices 	**Physical restraint devices:** • Used in conjunction with clasps locks and tags. • Use to reduce the likelihood of misuse of machinery/equipment or accidental energizing.

4. Explain the expulsion type lightening arrester with diagram and also write the properties of a lightening arrester?

Answer- Expulsion Type Lightning Arrester: It consists of an arc extinguishing chamber in series with an air gap. The arc extinguishing chamber is in the form of fiber tube which interrupts the arc after discharging the surge by the generation of gasses.
When a voltage surge occurs that is sufficient to spark over the series gap and the gap in the fiber tube, discharge current flows to ground. The arc in the tube attacks some of the fiber of tube walls, releasing a large amount of a relatively cool, non-conducting gas.



Expulsion type arrester

The gas produced in fiber tube acts not only to extinguish the arc but also builds up high pressure and expelled through the lower electrode which is hollow. As the gas leaves the tube violently, it wipes out the ionized air around the arc.
Due to this strong deionization effect, arc goes out at current zero instant and will not be re-established.

Property of lightening arresters:

- It not allows current to flow to the ground as long as the system voltage remains normal.
- Provide a path to ground, when the system voltage rises to a predetermined valve above normal, to dissipate the energy from the surge without raising the voltage at which the circuit is operating.
- It stops the flow of current to ground, as soon as the system voltage drops below the predetermined value, and restore the insulating qualities between the conductor and ground.
- Not be damaged by the discharge and be capable of automatically repeating discharging process frequently when required.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills
Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester,
End-Sem. Examination

Course Code: ELE1105 **Time: 2 Hours**
Course Name: Electrical Safety **Max. Marks: 50**

Instruction: Please read the questions carefully and try to answer in consecutive order. Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries four marks. Answer all questions from section C, each question carries six marks. Scientific calculator is allowed.

Section – A

10X01 = 10 Marks

1. What is good tripping time of RCCB?
   (a) Less than 30 Sec (b) 10 Sec (c) Less than 30 mSec (d)1 Sec
2. On Working Site, white helmet is for:
   (a) Engineer (b) Welder (c) Electrician (d) Safety Officer
3. What is the permitted value of a good earthing?
   (a) Less than 1 ohm (b) 10 ohm (c) Less than 5 ohm (d) 100 ohm
4. What is the full form of SPD?
   (a) Surge protection device (b) Shutdown protection device
   (d) Shock protection device (d) Surge prevention device
5. What is other name of mega-ohmmeter?
   (a) Earth Tester (b) Magger (c) Phase Tester (d) Multi Meter
6. Tool which we use for judge the quality and reliability of our work:
   (a) Inventory list (b) Check-list (c) Stock-register (d) work-permit
7. Which of the following is not the part of fire triangle?
   (a) Heat (b) Fuel (c) CO_2 (d) O_2
8. Which of the following is not the part of fire detection and alarm system?
   (a) Power Supply/Batteries (b) Programing Unit
   (c) MCP (d) Detectors
9. Which one is not the type of a lightening arrester?
   (a) Rod gap arrester (b) Expulsion type lightning arrester
   (c) Valve type lightning arrester (d) Tube type lightening arrester
10. Full form of MCP in fire safety system is:
    (a) Manual Call Point (b) Manual circuit point
    (c) Machine call point (d) Manual cross point

Section – B

04X04 = 16 Marks

1. Write Short Note on how we Select Proper breaker size for our Electrical circuit.
2. What is the advantages of electrical safety inspection?
3. Explain the working principle of lightening arrester with diagram and name the different types of lightening arrester.
4. Explain the different operating modes of Public announcement system and name the different components of PA system.

Section – C

04X06 = 24 Marks

1. Explain the fire triangle also explain the classification chart of different types of fire extinguishers.
2. Explain the importance of earthing in electrical system also explain the procedure of measuring the earth resistance.
3. Name the different types of PPE also describe the different types of hand protection gloves.
4. Write any four safe working point of working with
   A. Electrical Power tools
   B. Extension Cords

B

Answer Key Set – B
Course Code: ELE 1105
Course Name: Electrical Safety

School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester, End Sem. Examination

Section – A

1. C. Less than 30 mSec
2. A. Engineer
3. C. Less than 5 ohm
4. A. Surge protection device
5. B. Magger
6. B. Check-list
7. C. CO_2
8. B. Programing Unit
9. D. Tube type lightening arrester
10. A. Manual call point

Section – B

1. Write Short Note On how we Select Proper breaker size for our Electrical circuit?

Answer- For find the Proper Size of circuit breaker we follow the following steps:

- Calculate the total connected load of our building.
- Find the running time of different loads and calculate the maximum running load of a particular time of the day. Mostly we take 40 to 70 percent of connected load as a maximum running load at a time.
- Through Maximum running load, Get the maximum current which passes through the electrical circuit.
- According to maximum current, choose what kind of breaker we need for our system. Ex. For 0 to 63 Amp current we choose MCB, for 63 to 630 Amp we choose MCCB.
- After deciding our breaker type take the nearest market available size of breaker for our circuit. Ex. Available size of MCB is 1Amp, 6Amp, 16Amp, 20Amp, 25Amp etc. so if our maximum current is 22Amp we choose 25Amp MCB for our circuit.

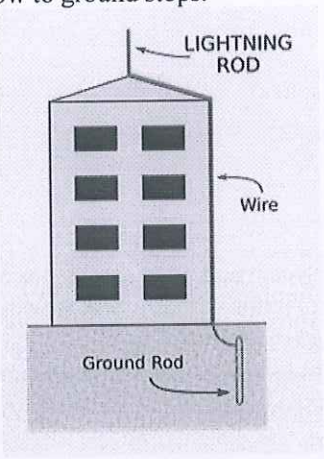
2. What is the advantages of electrical safety inspection?

Answer- Advantage of electrical safety inspection:

- Identify electrical wiring and components that may have degraded over time.
- Reveal if any electrical circuits are overloaded.
- Reveal if any lack of earthing.
- Identify any defective wiring or other mistakes made by non-certified electricians home-owners.
- Spot oversized fuses or breakers that may cause an electrical fire hazard.
- Find any potential electric shock risks.

3. Explain the working principle of lightening arrester with diagram and name the different types of lightening arrester?

Answer: - Lightning Arrester Working Principle: When a voltage surge traveling along the conductor reaches the point at which a lightning arrestor is installed it breaks down the insulation of the arrester momentarily, allowing the voltage surge to discharge to ground.
As soon as the system voltage drops below the predetermined value, insulation between the conductor and ground is restored and further current flow to ground stops.



Lightning Arrester Types:
- Rod gap arrester
- Expulsion type lightning arrester
- Valve type lightning arrester

4. Explain the different operating modes of Public announcement system and name the different components of PA system?

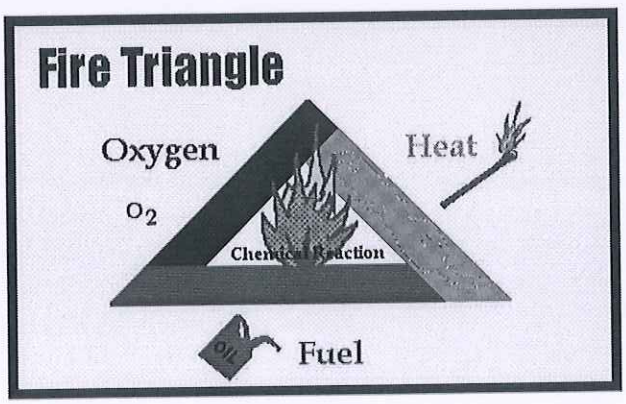
Answer- Alert Mode: also known as emergency mode. PA system sometimes work combined with Fire Alarm system of sometimes work independently. If PAS System call under the alarm then, this system automatically launches by the integrated input from the fire alarm panel and start pre-recorded warning message on all loops on full volume and bypass all other inputs.

Announcement mode: for making an announcement call it's used for general purpose announcement in this mode we can select the specific loop in which we want to make an announcement and also volume control units are also control the volume of announcement in specific areas.
Main components of PA system
- Amplifier
- Speakers
- Cables
- Mouth unit

Section – C

1. Explain the fire triangle also explain the classification chart of different types of fire extinguishers?

Answer-



CLASS	A	B	B	C	D	K
PICTURE SYMBOL						
TYPE	Common Combustibles Solids (wood, paper, cloth, etc.)	Flammable liquids Gasoline and solvents	Flammable gases Propane	Live electrical equipment Computers, fax machines	Combustible Metals Magnesium, Lithium, Titanium	Cooking Media Cooking oils and fats
Water	✓ Yes	✗ No	✗ No	✗ No	✗ No	✗ No
Foam	✓ Yes	✓ Yes	✗ No	✗ No	✗ No	✓ Yes (ABF Foam Only)
Dry Powder	✓ Yes	✓ Yes	✓ Yes	✓ Yes	✗ No	✗ No
M28/L2	✗ No	✗ No	✗ No	✗ No	✓ Yes	✗ No
Carbon Dioxide CO2	✗ No	✓ Yes	✗ No	✓ Yes	✗ No	✗ No
Wet Chemical	✓ Yes	✗ No	✗ No	✗ No	✗ No	✓ Yes

2. Explain the importance of earthing in electrical system also explain the procedure of measuring the earth resistance?

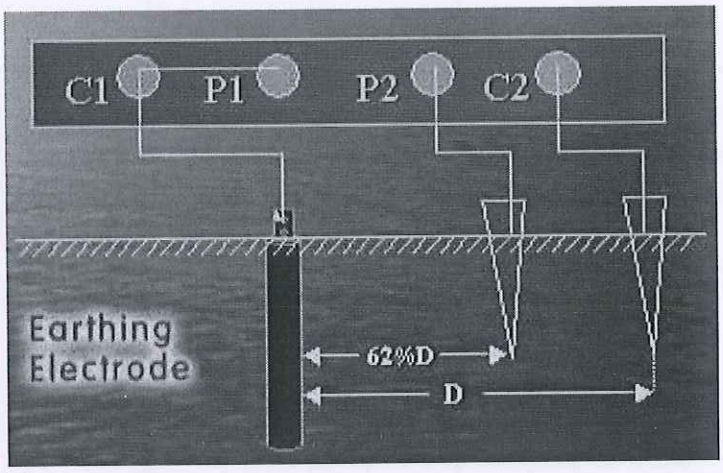
Answer- Requirement of Earthing in electrical system:

Earthing is an important component of electrical systems because of the following reasons:

- To provide earth connections for the neutral points of transformer, capacitor banks, generators, etc. It provides path for neutral currents of three phase AC system and thereby ensure stable neutral point.
- In cases of surges in the voltage, high voltages can pass through the electricity circuit. These kinds of overload can lead to damaging of devices and danger to human life. When earthing is installed with the electrical installations, the current is routed through a different path and does not affect the electrical system.

- To ensure that overhead shielding wires of transmission lines/ outdoor yards are securely earthed so that the overhead electrical equipment's, busbars are protected from direct lightning strikes.
- It prevents damage to electrical appliances and devices by preventing excessive current from running through the circuit.
- It prevents the risk of fire that could otherwise be caused by current leakage.
- It keeps people safe by preventing electric shocks.

Measuring the Earthing Resistance:
Earth Tester: The instrument used for measuring the resistance of the earth/soil is known as earth tester also called a grounding tester. It is used for sizing and projecting grounding grids.



Earth Resistance check by Earth Tester

C1 & C2 = Current terminal of earth tester.
P1 & P2 = Potential Terminals of earth tester.

- The distance of current spike from earth electrode D= 60 ft.
- Then distance of potential spike would be 62% of D = 0.62D i.e. 0.62*60= 37ft.
- In this method earth tester terminal C1 and P1 are shorted to each other and connected to the earth electrode (pipe) under test. Terminals P2 and C2 are connected to the two separate spikes driven in earth. These two spikes are kept in same line at the distance of specified length due to which there will not be mutual interference in the field of individual spikes.

when we rotate generator handle with specific speed, we get directly earth resistance on meter scale.

3. Name the different types of PPE also describe the different types of hand protection gloves?
Answer- Different equipment of Personal Protection:

- Hand Gloves
- Safety Goggles and Glasses
- Helmets and Head Covers
- Ear Protection buds
- Safety Shoes
- Safety Jacket

Hand Gloves: The workplace can create many hazards for your hands, whether from chemicals, cuts or burns. No single glove can provide appropriate protection for every work situation, so it is important to assess the risk for each task and select a glove that provides specialized protection.

- **Cotton and fabric gloves:** These can keep hands clean and protect against abrasions, but may not be strong enough to handle work with rough or sharp materials.

- **Electrical Rubber Gloves:** At the time of working with live electrical wires we should wear protection gloves. Electrical safety gloves are categorized by the level of voltage protection they provide and whether or not they are resistant to ozone. The voltage breakdown is as follows:
  - Class 00 — Maximum use voltage of 500 volts AC/proof tested to 2,500 volts AC
  - Class 0 — Maximum use voltage of 1,000 volts AC/proof tested to 5,000 volts AC
  - Class 1 — Maximum use voltage of 7,500 volts AC/proof tested to 10,000 volts AC
  - Class 2 — Maximum use voltage of 17,000 volts AC/proof tested to 20,000 volts AC
  - Class 3 — Maximum use voltage of 26,500 volts AC/proof tested to 30,000 volts AC
  - Class 4 — Maximum use voltage of 36,000 volts AC/proof tested to 40,000 volts AC

- **Coated fabric gloves:** This type of glove can provide protection against some moderate concentrated chemicals. They can be used in laboratory work provided they are strong enough to protect against the specific chemical being handled.
- **Rubber, plastic or synthetic gloves:** These types of glove can be used when cleaning or working with oils, solvents and other chemicals.
- **Leather gloves:** These should be used when welding, as the leather can resist sparks and moderate heat. The risk of cuts and abrasions also can be minimized by wearing leather gloves.
- **Aluminized gloves:** These gloves are recommended for welding, furnace and foundry work, as they provide reflective and insulating protection.
- **Kevlar gloves:** These have a wide variety of industrial applications. They are cut- and abrasion-resistant and provide protection against both heat and cold.
- **Chemical/liquid-resistant gloves:** Several types of gloves help protect against specific chemicals:

4. Write any four safe working point of working with
   A. Electrical Power tools
   B. Extension Cords

Answer- Working with Electrical Power Tool Safety

- Use the tool only for its designed purpose.
- Read the Owner's Manual and follow manufacturer's safety instructions.
- Remember electric-powered tools must have a three-wire plug with ground or be double insulated.
- Use of electric-powered tools with a GFCI breakers will drastically reduce the possibility of electric shock or electrocution.
- Wear appropriate PPE.
- If an extension cord is required, make sure it is for the correct wattage and has the proper plugs. Verify condition of the cord and plugs and check for rated use: indoor or outdoor.
- Ensure the power switch is "OFF" before plugging or unplugging tools.
- Never disconnect power by pulling on the cord – use the PLUG.
- Never carry a tool by the cord.
- Unplug the cord before making adjustments, changing/replacing parts/accessories.
- Inspect tool before each use. Replace tool if parts are worn or damaged as seen if Remove from service and tag "Danger, Do Not Operate.
- Do not use electric-powered tools in damp or wet locations.
- Keep the cord away from heat, oil/chemicals, sharp edges and ensure it doesn't become a tripping hazard.

Remember there are specific practices also when drilling or penetrating areas which may contain energized conductors.

i. Drilling or penetrating areas which contain or may contain energized electrical conductors is considered "working near". Such work requires extreme caution and good planning. Drills or

penetrating equipment must be grounded so that accidental contact with an unexpected energized electrical conductor will be cleared quickly by the circuit protective device. Double insulated equipment cannot be counted on to provide protection when accidental contact is made with energized circuits. A drill bit stop should be used to limit the distance of any penetration.

ii. Enclosures, raceways, compartments, walls, ceilings, floors or underground areas where energized electrical conductors are or may be hidden from direct view must be thoroughly investigated before penetrating into them. The custodian should ensure that an engineering review of drawings or other documentation about the work site is conducted.

Working with Extension Cords

- Inspect the cord before each use. Replace the cord if worn or damaged. Remove from service and tag "Danger, Do Not Operate."
- Keep extension cords away from heat, oil/chemicals, sharp edges and ensure they do not become a tripping hazard.
- Make sure extension cord is for the correct amperage and has the proper plug.
- Verify condition of the cord and plugs and check rated use: indoor or outdoor.
- Don't overload electrical outlets.
- Never disconnect power by pulling on the cord – use the PLUG.