BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 1st Semester,
End – Sem. Examination

Course Code: ELE 1101 **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. Which type of plug and sockets are used in India?
   (a) Type M (b) Type I (c) Type D (d) Type A
2. Nowadays switch and sockets are made of which material?
   (a) VIR (b) Bakelite (c) PVC (d) Porcelain
3. NEC stands for_____.
   (a) National Energy Code (b) New Electricity Commission
   (c) National Electrical Code (d) None of these
4. All ceiling fans should be hung not less than _____ height above the floor.
   (a) 2 m (b) 2.75 m (c) 1.75 m (d) 2 m
5. A fuse is to be connected in _____ in electrical circuit.
   (a) Parallel (b) Series (c) Both a and b (d) None of these
6. Electrical energy meter is used for measuring:
   (a) Power (b) Energy (c) Both a and b (d) None of these
7. Personal protective equipments are used for safety of which parts of body?
   (a) Hand (b) Eye (c) Face (d) All of these
8. Conductivity is the reciprocal of _____.
   (a) Conductance (b) Resistivity (c) Resistance (d) None of these
9. Which is not an insulator?
   (a) Wool (b) Plastic (c) Copper (d) Glass
10. What type of plugs and sockets should be used in house wiring according to NEC?
    (a) 3-pin type (b) 2-pin type (c) Both a and b (d) None of these

Section – B

04X04 = 16 Marks

1. Explain any four types of socket and plugs.
2. What are the advantages and disadvantages of concealed conduit wiring?
3. Why flux is used in soldering?
4. What are the uses of combination plier, nose plier and side cutting plier?

Section – C

04X06 = 24 Marks

1. What is electrical switch? Explain all types of electrical switches with symbol.
2. A 15-meter length of wire has a cross-sectional area of $2cm^2$ and a resistance of 10 ohms. Calculate the conductivity and resistivity of the wire.
3. What is normal power rating drill machine? How to use power drill machine safely?
4. Explain following terms regarding house wiring:
   (i) Casing capping (ii) Ceiling rose (iii) Junction box

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School of Electrical Skills
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Course Code: ELE1101 **Time: 2 Hour**
Course Name: Construction Electrician **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

A1. (c) Type D
A2. (b) Bakelite
A3. (c) National Electrical Code
A4. (b) 2.75 m
A5. (b) Series
A6. (b) Energy
A7. (d) All of above
A8. (b) Resistivity
A9. (c) Copper
A10. (a) 3-pin type

Section – B

04X04 = 16 Marks

A1. **Plug and socket:** AC power plugs and sockets connect electric equipment to the alternating current power supply in buildings and at other sites. Electrical plugs and sockets differ from one another in voltage and current rating, shape, size, and connector type. Different standard systems of plugs and sockets are used around the world.

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

Type G
- It is mainly used in the United Kingdom, Ireland, Malta, Malaysia & Singapore.
- 3 pins
- grounded
- 13 A
- 220 – 240 V
- socket compatible with plug type G

Type H
- It is used exclusively in Israel, the West Bank & the Gaza Strip.
- 3 pins
- grounded
- 16 A
- 220 – 240 V
- socket compatible with plug types C & H (unsafe compatibility with E & F)

Type I
- It is mainly used in Australia, New Zealand, China & Argentina.
- 2 or 3 pins
- 2 pins: not grounded / 3 pins: grounded
- 10 A
- 220 – 240 V
- socket compatible with plug type I

Type J
- It is used almost exclusively in Switzerland & Liechtenstein.
- 3 pins
- grounded
- 10 A
- 220 – 240 V
- socket compatible with plug types C & J

Type K
- It is used almost exclusively in Denmark & Greenland.
- 3 pins
- grounded
- 16 A
- 220 – 240 V
- socket compatible with plug types C & K (unsafe compatibility with E & F)

Type L
- It is used almost exclusively in Italy & Chile.
- 3 pins
- grounded
- 10 A & 16 A
- 220 – 240 V
- 10 A socket compatible with plug types C & L (10 A version) / 16 A socket compatible with plug type L (16 A version)

Type M
- It is mainly used in South Africa.
- 3 pins
- grounded
- 15 A
- 220 – 240 V
- socket compatible with plug type M

Type N
- It is used in Brazil and South Africa.
- 3 pins
- grounded
- 10 A & 20 A
- 100 – 240 V
- socket compatible with plug types C & N

Type O
- It is used exclusively in Thailand.
- 3 pins
- grounded
- 16 A
- 220 – 240 V
- socket compatible with plug types C & O (unsafe compatibility with E & F)

A2. **Concealed conduit wiring advantages and disadvantages:**

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. 3. Flux:
- Flux is a chemical cleaning and flowing agent which is used in soldering. The basic purpose of using flux in soldering is to prevent the oxidation of the filler and base materials.
- Flux is designed to improve electrical contact and mechanical strength in solder joints. There are mainly two types of flux cores. Acid core and rosin core. Acid core is used for plumbing and rosin core is used for electronics.
- Generally, the ZnO (Zink oxide) flux is used for electronic purpose.

Ans. 4. Pliers:

Combination pliers are 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 pliers are 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 (or 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.

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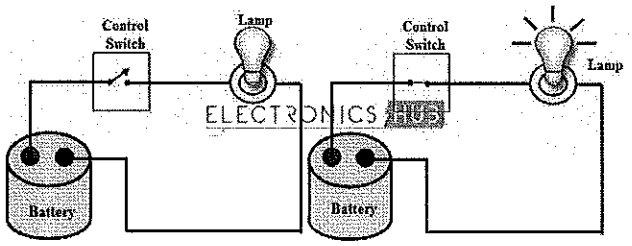
04X06 = 24 Marks

Ans. 1.

Switches: A switch is a device which is designed to interrupt the current flow in a circuit, in other words, it can make or break an electrical circuit. Every electrical and electronics application uses at least one switch to perform ON and OFF operation of the device.

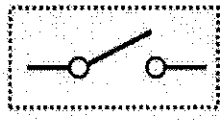
When the contacts of a switch are closed, the switch creates the closed path for current flow and hence load consumes the power from source. When the contacts of a switch are open, no power will be consumed by the load as shown in below figure.



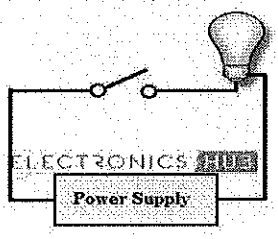
Based on the number of poles and throws, switches are classified into following types:

1. 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.

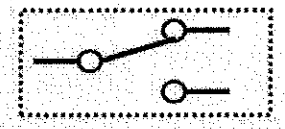


Symbol

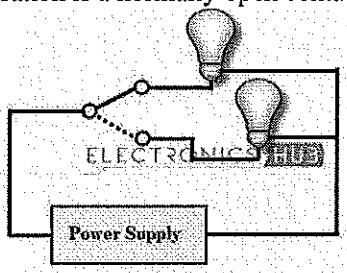


2. Single Pole Double Throw Switch (SPDT): This switch has three terminals, one is input contact and remaining two are output contacts.

- 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.



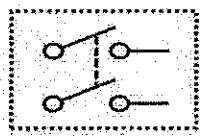
Symbol



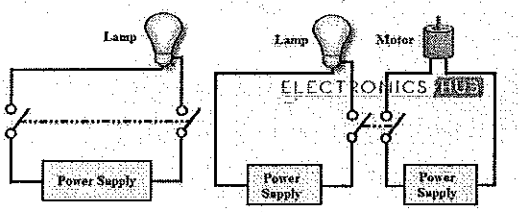
SPDT Switch Circuit

3. 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.

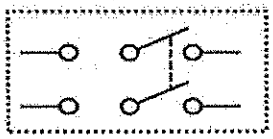


Symbol



4. Double Pole Double Throw Switch (DPDT): This is a dual ON/OFF switch consisting of two ON positions.

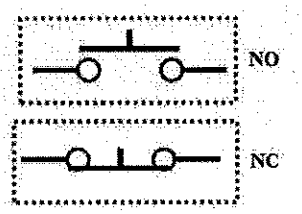
- It has six terminals, two are input contacts and remaining four are the output contacts.
- It behaves like a two separate SPDT configuration, operating at the same time.
- Two input contacts are connected to the one set of output contacts in one position and in another position, input contacts are connected to the other set of output contacts.



Symbol

5. Push Button Switch: It is a momentary contact switch that makes or breaks connection as long as pressure is applied (or when the button is pushed).

- Generally, this pressure is supplied by a button pressed by someone's finger.
- This button returns its normal position, once the pressure is removed.
- The internal spring mechanism operates these two states (pressed and released) of a push button.
- It consists of stationary and movable contacts, of which stationary contacts are connected in series with the circuit to be switched while movable contacts are attached with a push button.
- Push buttons are majorly classified into normally open, normally closed and double acting push buttons as shown in the above figure.



Ans. 2.

Data given: DC resistance, R = 10 ohms, cable length, L = 15m, and the cross-sectional area of the conductor is $2cm^2$ giving an area of: A = 2 x 10^{-4} or 2/10000 $meters^2$.

$R = \frac{\rho L}{A}$ so $\rho = \frac{R X A}{L}$

$\rho = \frac{10 X 2}{15 X 10000}$

ρ = 13.33 x 10^{-5} ohm-meter

$\sigma = \frac{1}{\rho}$

$\sigma = \frac{100000}{13.33}$

σ = 7501 1/ohm-meter

Ans. 3. Power Drill machine:

A power drill is an electrical motor that rotates a replaceable drill bit to make a hole in wood, plastic, or metal. Alternately, a screwdriver tip can be installed to turn screws. The parts of a power drill include the handle, an on/off trigger with safety latch, a reversing switch for changing the rotation direction of the drill bit, a torque adjustment, and the chuck that holds the drill bit in place. Corded drills are powered by a 220-volt electrical cord inserted into an electrical receptacle; cordless drills are powered by a battery in the drill's handle.

How to Safely Use a Power Drill:

To safely use a power drill, first make sure the drill switch is in the off position and/or unplug the electrical cord if so equipped. Loosen the chuck and insert the appropriate bit or tip shaft, then tighten

the chuck. Some power drills require a special tool to firmly tighten the chuck. As needed, set the torque adjuster to control slippage of the drill bit, useful when turning screws without damaging the screw head. Plug in or insert the battery into the power drill. Place the point of the drill bit or screwdriver tip as needed. Press the safety latch and on/off trigger. Push the drill bit or screwdriver forward as the chuck rotates.

Ans. 4. Explained terms:

(a) **Casing Capping:** This is one of the simple forms of electric wiring systems. This is little bit old/conventional wiring system. Now days we very often use this cashing capping electric wiring system. As the name referred in this wiring, PVC insulated wires are placed in plastic cashing and covered with cap. The casing is of rectangular cross section as shown.

The color of cashing channel and cap are normally white or grey. The cashing channel and cap are normally made of either plastic or wood. The channels and caps are available in the market in standard length. The commonly available standard lengths are 1 meter, 10 feet and 6.5 feet etc.

We can fit the channels in both vertical and horizontal alignment. In corners and junctions, we can use elbow joint and tee joints respectively.

(b) **Ceiling rose:** Ceiling rose helps in that one live wire that is needed for ceiling light or fan to go in continuation. Wiring Ceiling Roses and the lighting circuit. In house wiring the celling rose is used at different places for creating junction points for branching the wirings.

(c) **Junction box:** A junction box is used to make junction of electrical connections in building or house that provides protection and a safety barrier for electrical connections. These boxes are made from plastic and form part of your home or other building's electrical wiring system.

Answer Key ELE 1102 Set – A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, I Semester,

End-Sem. Examination

Course Code: ELE 1102 **Time: 2 Hours**

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

Section – A

1. (a) 1:0.2
2. (c) 1- ii; 2- iv; 3- iii; 4- i
3. (a) 0.914 m
4. (c) Electrical
5. (b) A1
6. (a) 13 mm diameter
7. (b) IE rules, 1956
8. (b) 1:3
9. (c) 
10. (b) Continuous thin straight

Section – B

Ans-1

Step Potential: Voltage between the feet of a person

When current is flowing from the tower to the earth ground, the ground potential rises at the tower and a voltage gradient will occur based on the resistivity of the soil, resulting in a potential difference between two points on the ground. This is called a Step Potential as it can cause voltage between a person's feet.

Touch Potential: Voltage between energized object and feet of a person

If the ground connection between the tower and the soil is high resistance (common with some soil conditions), the tower itself (and any conductive item touching the tower) can be energized. Touch potential is the voltage between the energized object and the feet of a person in contact with the object.

Ans-2

Distribution substation may be subdivided into the following types:

(i) H-pole mounted: Transformers of low rating say 25, 40, 63, 100 and 200 kVA are mounted on rolled steel fixtures which are rigidly fastened to the two poles.

(ii) Platform mounted: A platform is constructed on a four-pole structure for placing the transformer on it. Platform mounting is done for transformers of capacity 250, 300 and 400 kVA.

(iii) Plinth or foundation mounted: Transformers above 500 kVA are placed on a plinth or foundation with a wall or fence surrounding it.

Ans-3

Points to be considered for selection of wiring:

Initial cost : It should be economical.

Durability: It must be able to withstand wear and tear due to weather.

Safety from fire: It should be free from risk of fire as far as possible.

Mechanical Protection: It must provide good mechanical protection to the cables.

Permanency: The wiring must not be affected by the action of weather, fumes, dampness, chemicals etc.,

Appearance: It is an architectural point of view.

Accessibility: It should be easy to extend or repair the wiring.

Life: The System adopted should have good life.

Maintenance Cost: It should be low.

Ans-4

Types of wiring:

1. Cleat wiring
2. Wooden casing and capping wiring
3. Lead sheathed wiring
4. Conduit pipe wiring

CLEAT WIRING:

- very simple method and cheapest one
- Single core PVC OR VIR Cables are used in this system
- cleats are made up of porcelain and have two parts base piece and cap

- When wires are passed on to the walls or ceiling, they must take through conduit pipes.
- This system is not used on damp walls, ceilings.
- Its life time is 5 years approximately.

ADVANTAGES:

- fault can be easily identify
- Materials collected after removal of installation can be used for further wiring
- Expansion of wiring is possible

DISADVANTAGES:

- less safety
- poor appearance
- can't use it for permanent Installation

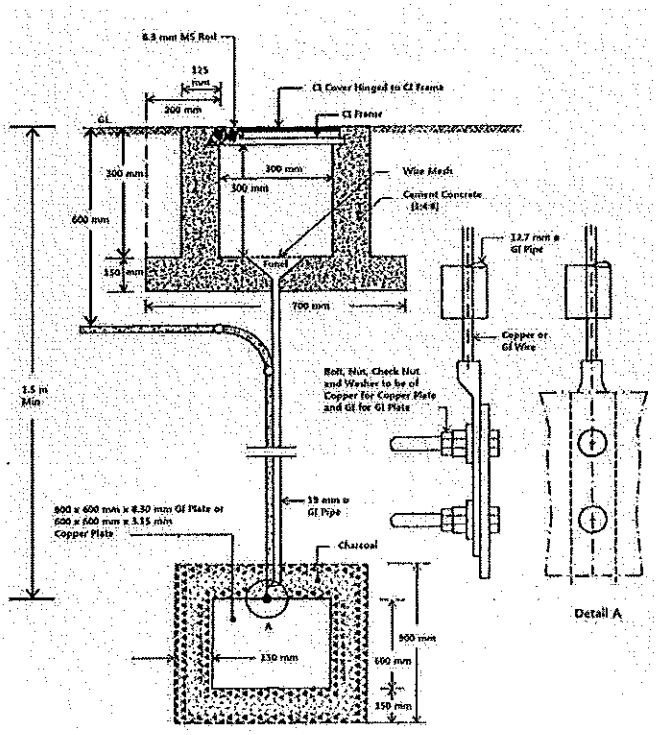
Section – C

04X06 = 24 Marks

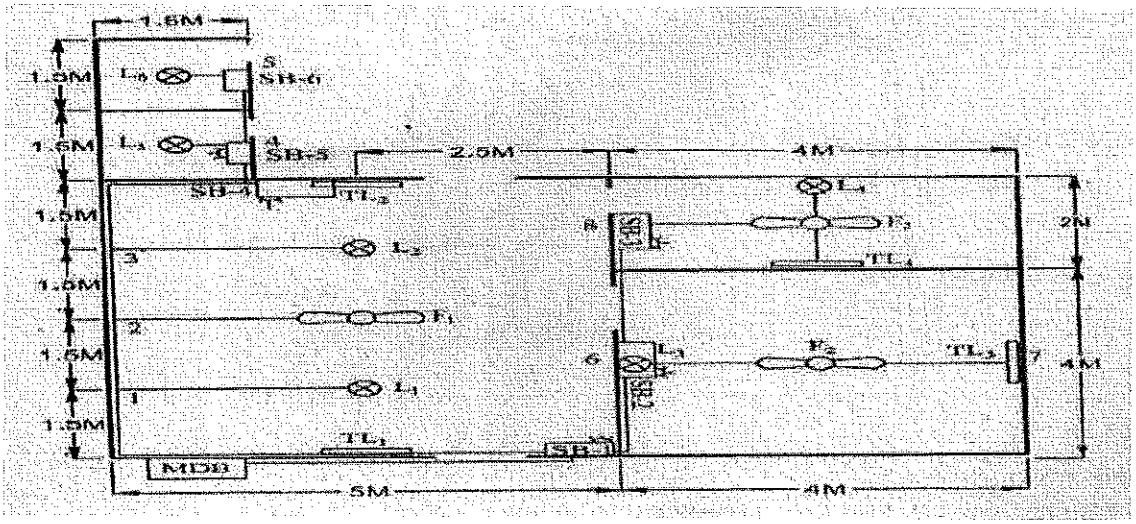
Ans-1

Effective earthing safeguards people from risk of electric shock. Hazardous-live-parts shall not be accessible and accessible conductive parts shall not be hazardous live. Ensures a low impedance route to the general mass of earth for currents in the electrical system, under both normal and fault conditions. The various methods employed in earthing (in house wiring or factory and other connected electrical equipment and machines) are (a) plate earthing, (b) pipe earthing and (c) rod earthing.

Plate Earthing-



Ans-2



Total Load:

Assuming (1) Fan point - 60 watts
(2) Light point - 60 watts
(3) Tub light point - 40 watts
(4) Plug point - 100 watts

Total load	(i)	Fan load	= 3 x 60	= 180 watts
	(ii)	Light load	= 6 x 60	= 360 watts
	(iii)	Tube light load	= 4 x 40	= 160 watts
	(iv)	Plug point load	= 5 x 100	= 500 watts
				1200 watts

Number of Sub-circuit:

Power per circuit = 800 watts or 10 points

$\therefore$ No of sub circuits $= \frac{1200}{800} = 2$ circuits

Current drawn by the components-

Calculation of current

$$\text{Total current } I = \frac{\text{Total load}}{230} = \frac{1200}{230} = 5 \text{ A}$$

$$\text{Current of sub circuit 1} = \frac{680}{230} = 2.95 \text{ Amps}$$

$$\text{Current of sub circuit 2} = \frac{520}{240} = 2.26 \text{ Amps}$$

Selection of Main switch and DB

Total current = 5.21 A

$\therefore$ Maximum current = 2 x Full load current

= 2 x 5.21 = 10.42 A

Ans-3 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.

Ans-4 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

Types of blueprint-

1. Electrical Construction Drawings
2. Schematic or Wiring Diagrams
   - One-line diagram
   - Three-line diagram
   - Ladder diagram
3. Panel and Switchgear Drawings
4. Bill of Material
5. Schedules
   - Panels
   - Light fixture
   - Motor
   - Conduit and cable
6. Lighting and Power Plans
   - Lighting

• Power

• Ancillary system

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.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 1st Semester,
End – Semester Examination

Course Code: ELE 1103 **Time: 2 Hours**
Course Name: Basic Electrical Engineering **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 frequency of direct current is:
   (a) 50 hertz (b) 60 hertz (c) Zero hertz (d) None of these

2. The form factor of a sinusoidal wave is:
   (a) 1.11 (b) 1.5 (c) 1 (d) 1.4

3. The average value of the alternating current over one complete cycle is:
   (a) Zero (b) 0.637 x I_{max} (c) 0.707 x I_{max} (d) one

4. In an a.c. circuit containing only inductor, the current:
   (a) Lead the voltage by 90^0 (b) Lags the voltage by 90^0
   (c) Remains in phase with voltage (d) Lags the voltage by 180^0

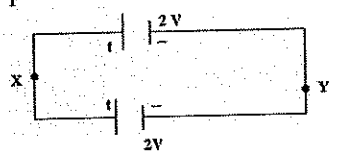
5. The quantity remains unchanged in transformer
   (a) Voltage (b) Current (c) Frequency (d) None of these

6. Which relation for transformer is correct?
   (a) $\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$ (b) $\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_2}$
   (c) $\frac{V_1}{V_2} = \frac{N_2}{N_1} = \frac{I_1}{I_2}$ (d) $\frac{V_2}{V_1} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$

7. The energy stored in inductor of inductance L and current I is given by:
   (a) ½ L I^2 (b) ½ L^2 I (c) ½ L I (d) ½ L^2 I^2

8. 3 identical bulbs are connected in series and they together dissipate a power P. If these bulbs are connected in parallel, then power dissipated by them:
   (a) P/3 (b) 3 P (c) 9 P (d) P/9

9. Two similar cells each of emf E and internal resistance *r* connected as shown in figure then the potential difference between X & Y is:



   (a) 4 V (b) 2 V (c) Zero (d) None of these

10. The elements like Resistance, Inductance and Capacitance are called: -
    (a) Passive elements (b) Active elements
    (c) Both Active & passive elements (d) None of the above

Registration No.: .....

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Section – B

04X04 = 16 Marks

1. Does a transformer change the frequency?
2. Which value of current do you read with a.c. Ammeter?
3. The frequency of a.c. is doubled how do R, XL and Xc get affected?
4. Write the names of different types of induction motors and their applications.

Section – C

04X06 = 24 Marks

1. The electric mains in a house are marked 220V, 50 Hz. Write down the equation for instantaneous voltage.
2. A 50 Hz a.c. is flowing in 14 mH coil. Find the reactance.
3. A 1.50 μf capacitor is connected to a 220 V, 50 Hz source. Find the capacitance reactance and the current in the circuit.
4. Calculate the speed of squirrel cage induction motor of 2 poles when the motor has been given the supply of 415 Volts at 60 cycles.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 1st Semester,
End – Semester Examination

Course Code: ELE 1103 **Time: 2 Hours**
Course Name: Basic Electrical Engineering **Max. Marks: 50**

Section – A

10X01 = 10 Marks

1. The frequency of direct current is:
   (a) 50 hertz (b) 60 hertz (c) Zero hertz (d) None of these

2. The form factor of a sinusoidal wave is:
   (a) 1.11 (b) 1.5 (c) 1 (d) 1.4

3. The average value of the alternating current over one complete cycle is:
   (a) Zero (b) 0.637 x I_{max} (c) 0.707 x I_{max} (d) one

4. In an a.c. circuit containing only inductor, the current:
   (a) Lead the voltage by 90^0 (b) Lags the voltage by 90^0
   (c) Remains in phase with voltage (d) Lags the voltage by 180^0

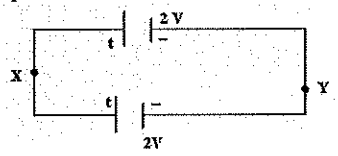
5. The quantity remains unchanged in transformer
   (a) Voltage (b) Current (c) Frequency (d) None of these

6. Which relation for transformer is current?
   (a) $\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$ (b) $\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_2}$
   (c) $\frac{V_1}{V_2} = \frac{N_2}{N_1} = \frac{I_1}{I_2}$ (d) $\frac{V_2}{V_1} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$

7. The energy stored in inductor of inductance L and current I is given by:
   (a) ½ L I^2 (b) ½ L^2 I (c) ½ L I (d) ½ L^2 I^2

8. 3 identical bulbs are connected in series and they together dissipate a power P. If these bulbs are connected in parallel, then power dissipated by them:
   (a) P/3 (b) 3 P (c) 9 P (d) P/9

9. Two similar cells each of emf E and internal resistance *r* connected as shown in figure then the potential difference between X & Y is:



   (a) 4 V (b) 2 V (c) Zero (d) None of these

10. The elements like Resistance, Inductance and Capacitance are called: -
    (a) Passive elements (b) Active elements
    (c) Both Active & passive elements (d) None of the above

Section – B

04X04 = 16 Marks

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1. Does a transformer change the frequency?

Ans. No, in transformer the frequency of alternating voltage remains same at secondary side. It changes only voltage.

2. Which value of current do you read with a.c. Ammeter?

Ans. Root mean square value of the current.

An ammeter (from Ampere Meter) is a measuring instrument used to measure the current in a circuit. Electric currents are measured in amperes (A), hence the name. Instruments used to measure smaller currents, in the milliampere or microampere range, are designated as milliammeters or microammeters.

3. The frequency of a.c. is doubled how do R, XL and Xc get affected?

Ans. R remains un affected

X_L get doubled because X_L x f.
X_L becomes one half of the original value because X_C x 1/f

4. Write the names of different types of induction motors and their applications.

Ans. **Three-phase AC induction motors** are widely used in industrial and commercial **applications**. These are of two **types**, squirrel cage and slip ring **motors**. Squirrel cage **motors** are widely used due to **their** rugged construction and simple design. Slip ring **motors** require external resistors to have high starting torque. **Alternating-current motors are of three general types, induction, synchronous, and series, and are defined as follows:**

- Induction Motors. ...
- Squirrel-Cage Induction Motor. ...
- Wound-Rotor Induction Motor. ...
- Synchronous Motor. ...
- Series-Wound Motor. ...
- Polyphase Motors. ...
- Design Letters. ...
- Single-phase Motors.

Three-phase squirrel-cage **induction motors** are widely used as industrial drives because they are self-starting, reliable and economical. Single-phase **induction motors** are used extensively for smaller loads, such as household appliances like fans.

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Section – C

04X06 = 24 Marks

1. The electric mains in a house are marked 220V, 50 Hz. Write down the equation for instantaneous voltage.

Ans. Here V_{rms} = 220 V. F = 50 Hz

Instantaneous Voltages is given by

$e = V_{max} \sin w t$

$= \sqrt{2} \times V_{rms} \sin 2 \pi f t$

Since $V_{max} = \sqrt{2}\ V_{rms}$

$W = 2 \pi f$

$e = 1.414 \times 220\ V \sin (2x3.14x50)\ t$

$= 311 \sin 314\ t$ Volt.

$= 311 \sin 314\ t$ Volt. Answer.

2. A 50 Hz a.c. is flowing in 14 mH coil. Find the reactance.

Ans. here f = 50 Hz L = 14 mH $= 14x10^{-3}$ H
Reactance $X_L = 2 \pi f L$
$= 2 \times 22/7 \times 50 \times 14 \times 10^{-3}$
= 4.4 ohm.

3. A 1.50 μf capacitor is connected to a 220 V, 50 Hz source. Find the capacitance reactance and the current in the circuit.

Ans. here C = 1.5 μf
$= 1.5x10^{-6}$f
V_{rms} = 220 V
f = 50 Hz
$XL = 1/2 \pi f C$
$= 1/2x3.14x50x1.5x10^{-6}$
$= 212\ \Omega$
$I_{rms} = V_{rms}/ XC$
= 220/212 = 1.04 Answer.

4. Calculate the speed of squirrel cage induction motor of 2 poles when the motor has been given the supply of 415 Volts at 60 cycles.

Ans. $N = 120\ f / P$
= 120/2x60
= 3600 RPM Answer

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

Session: 2019-20 (Summer / Winter Semester)

B. Voc. Program, 1st Semester,

End – Sem. Examination

Course Code: ELE1104 **Time: 2 Hours**

Course Name: Maintenance Technician Electrical **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 rating all electric iron is expressed in:

   (a) Watt (b) kVA (c) kWh (d) HP

2. The capacity an air conditioner is expressed in:

   (a) Watt (b) HP (c) kWh (d) Tons

3. Which type of magnet is used in an electric bell:

   (a) Temporary (b)Magnet (c)Electromagnet (d) Carbon Magnet

4. Unit of frequency is:

   (a) Hertz (b) Cycles per second
   (c) Second (d) Both (a) & (b)

5. What does the Japanese world seiri refers to?

   (a) sorting out (b) Systematic arrangement
   (c) sweep (d) self-discipline

6. The process of taking measures to check the quality, performance, or reliability of the equipment

   (a) Testing (b) servicing
   (c) Inspecting (d) Analyzing

7. What does "EPM" means?

   (a) Electrical preventive maintenance
   (b) Energy Product machine
   (c) Electrical Personnel management
   (d) Equipment for Productive Management

8. The process of repairing, providing maintenance, and keeping the machine in good condition.

   (a) servicing (b) Inspecting (c) Testing (d) Analyzing

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9. Full form of ELCB:
   (a) Earth leakage circuit breaker (b) Earth leakage current breaker
   (c) Earthing leakage breaker (d) None of these
10. Which of these benefits of 5S are of value to your company?
   (a) Improved safety (b) Increase productivity
   (c) Increase profitability (d) All of these.

Section – B

04X04 = 16 Marks

1. Write down the parts of electric Kettle.
2. Write down the advantages of 5 S.
3. Write down the any four step of autonomous maintenance.
4. What is hazard & risk? Name the different types of hazards.

Section – C

04X06 = 24 Marks

1. Write down the 8 pillar of Total Productive Maintenance (TPM).
2. Write down the advantages and disadvantages of analog and digital megger.
3. What is the full form of CMMS? Draw the block diagram of organization structure of maintenance department.
4. Write down the troubleshooting chart of DRY Iron.

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School of Electrical Skills

Session: 2019-20 (Summer Semester)

B. Voc. 1st Semester,

End-Sem. Examination

Course Code: ELE1104 **Time: 2 Hours**

Course Name: Maintenance Technician Electrical **Max. Marks: 50**

Answer Sheet

Section A

1 A

2 D

3 C

4 d

5 A

6 A

7 A

8 A

9 A

10 D

Section B

Ans.1.

1 Handle 2 Kettle 3 Heating element enclosed in mica insulation 4 Sole Plate 5 Screws 6 Switch 7 Bottom cover screw 8 outlet socket terminal 9 bottom cover 10 abonite feet.

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.

Step 0: Education: Understanding functions of equipment & Maintenance
Step 1: Cleaning: Initial cleaning
Step 2: Sources: Eliminate sources of contamination
Step 3: Standards: Establish standard inspections, cleaning and lubrication
Step 4: Inspection: Check levels, leaks, tighten, damage and wear.

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Ans. 4.

- A hazard is something that can cause harm, e.g. electricity, chemicals, working up a ladder, noise, a keyboard, a bully at work, stress, etc.
- A risk is the chance, high or low, that any hazard will actually cause somebody harm
- Safety hazards – ex. Electrical hazards, wet floor, fire
- Biohazards- virus, bacteria, fungi, parasites
- Chemical Hazards- cleaning agents, insecticides, preservatives, etc
- Physical Hazards- high temperature, vibration, radiation
- Ergonomic hazards- wrong posture and movements while working
- Psychological Hazards- anything that can cause stress. Ex. Workloads, fears or
- phobia, etc.

Section C

Ans. 1.

1 Autonomous Maintenance (Jishu Hozen)

2 Individual Improvement (Kobetsu kaizen)

3 Planned maintenance (Keikaku hozen)

4 Quality Maintenance (Hinshitsu Hozen)

5 Education & Training

6 Safety, Health & Environment

7 Development Management

8 Office TPM

Ans. 2.

Advantages of Hand Operated Megger

1. Still keeps important in such high-tech world as it's an oldest method for IR value determination.
2. No external source required to operate.
3. Cheaper available in market.

Disadvantages of Hand Operated Megger

1. At least 2 person required to operate i.e. one for rotation of crank other to connect megger with electrical system to be tested.

2. Accuracy is not up to the level as it's varies with rotation of crank.
3. Require very stable placement for operation which is a little hard to find at working sites.
4. Provides an analog display result.
5. Require very high care and safety during use of the same.

Advantages of Electronic Type Megger

1. Level of accuracy is very high.
2. IR value is digital type, easy to read.
3. One person can operate very easily.
4. Works perfectly even at very congested space.
5. Very handy and safe to use.

Disadvantages of Electronic Type Megger

1. Require an external source of energy to energies i.e. Dry cell.
2. Costlier in market.

Ans. 3.

Computerized maintenance management system

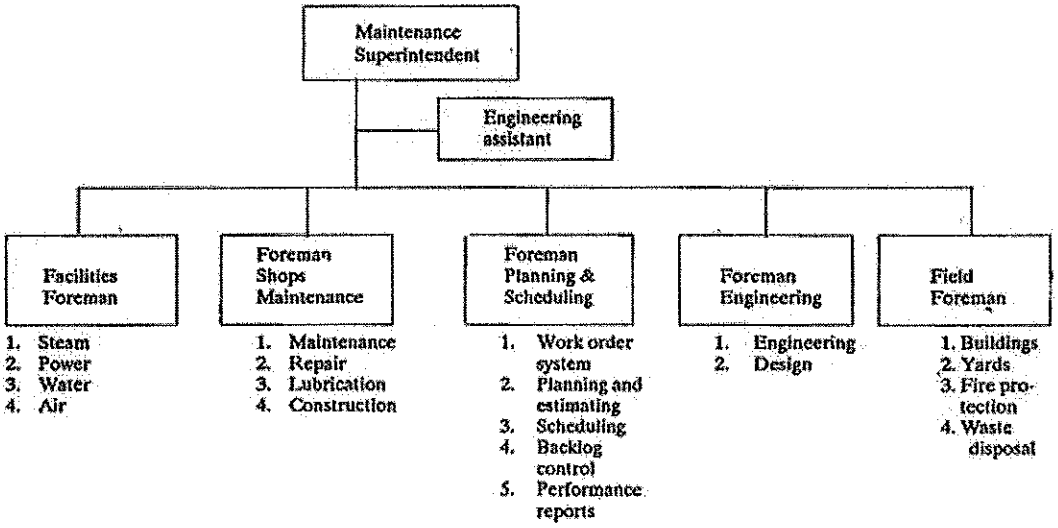

Fig. 13.1. Organization structure of maintenance department.

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Ans. 4.

Trouble	Possible Cause	Corrective action to be taken
No Heat	No Power at outlet	Check outlet for power
	Defective heater element	Replace the element
	Defective Thermostat	Replace thermostat
	Defective cord or plug	Repair or replace
Insufficient heat	Low line voltage or Incorrect thermostat setting	Check voltage outlet. Adjust and recalibrate thermostat
Excessive Heat	Incorrect thermostat setting Or defective thermostat	Adjust and recalibrate thermostat or replace
Power cord	Loose connection Broke wire	Clean and tighten Repair or replace

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 1st Semester,
End – Semester Examination

Course Code: ELE 1105 **Time: 2 Hours**
Course Name: Electrical Safety **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. All medium voltage equipment should be earthed by:
   (a) Two separate and distinct connections (b) One connection only
   (c) No need of earthing (d) None of these

2. If you want to do the maintenance of transformer in 132 kV switch yard, then which sequence of operation to be followed for isolator and breaker:
   (a) First open the isolator then trip the breaker
   (b) First trip the breaker then open the isolator
   (c) Both should be opened simultaneously
   (d) None of these operation required

3. When working with ladders for maintenance work then ladders should be kept at an angle of:
   (a) 75 degrees (b) 60 degree (c) 45 degree (d) 90 degree

4. TQM stands for:
   (a) Total quality management (b) Total quality material
   (c) Total quality manpower (d) None of these

5. 11kV cables should be laid below ground level at a minimum depth of:
   (a) One meter (b) Two meters (c) Three Meters (d) None of these

6. Human body can withstand electrical shock up to .....
   (a) 100 Amps (b) 1 Amp (c) 30 mA (d) Few micro amps

7. What temperatures are possible in an Arc flash accident at the Arc?
   (a) 200^0 C (b) 1000^0 C (c) 19400^0C (d) Can't be measured

8. Which agents are used for electrical fire quenching?
   (a) CO_2 (b) FM 200 (c) Inert Gases (d) All of above

9. A person qualified to perform electrical work must possess: -
   (a) Skills/techniques to distinguish live parts from other parts of electrical equipment.
   (b) Skills and techniques to determine the nominal voltage of exposed live parts.
   (c) Knowledge on the use of PPE, insulating and shielding materials, and insulated tools.
   (d) All of the above.

10. Which IS is applicable for the portable Extinguishers for their performance and construction specifications?
    (a) IS 325 (b) IS 15683 (c) IS 9001 (d) None of these

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

04X04 = 16 Marks

1. Why is it essential to provide earthing in electrical systems?
2. Describe the hazards from electrical equipment.
3. Why is smoking prohibited in the battery charging areas?
4. What do you understand by low, medium, high and extra high voltage?

Section – C

04X06 = 24 Marks

1. Which are the different types of extinguisher and where they are used?
2. What will you do when an electrician suffered with an Electrical shock?
3. What precautions to be taken for avoiding any electrical fire?
4. Write the safety instructions which have to be followed when working on a transformer.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 1st Semester,
End – Semester Examination

Course Code: ELE 1105 **Time: 2 Hours**
Course Name: Electrical Safety **Max. Marks: 50**

Section – A

10X01 = 10 Marks

Q.1. (A) All medium voltage equipment should be earthed by:
(a) Two separate and distinct connections (b) One connection only
(c) No need of earthing (d) None of these
Ans. (a)

Q.2. (A) If you want to do the maintenance of transformer in 132 kV switch yard then which sequence of operation to be followed for isolator and breaker:
(a) First open the isolator then trip the breaker (b) First trip the breaker then open the isolator
(c) Both should be opened simultaneously (d) None of these operation required
Ans. (b)

Q.3. (A) When working with ladders for maintenance work then ladders should be kept at an angle of:
(a) 75 degree (b) 60 degree (c) 45 degree (d) 90 degree
Ans. (a)

Q.4. (A) TQM stands for:
(a) Total quality management (b) Total quality material
(c) Total quality manpower (d) None of these
Ans. (a)

Q.5. (A) *11kV cables* should be laid below ground level at a minimum *depth of*:
(a) One meter (b) Two meters (c) Three Meters (d) None of these
Ans. (a)

Q.6. Human body can withstand electrical shock up to .....
(a) 100 Amps (b) 1 Amp (c) 30 mA (d) Few micro amps
Ans. (c)

Q.7. What temperatures are possible in an Arc flash accident at the Arc?
(a) 200^0 C (b) 1000^0 C (c) 19400^0C (d) cannot be measured
Ans. (c)

Q.8. Which agents are used for electrical fire quenching?
(a) CO_2 (b) FM 200 (c) Inert Gases (d) All of above
Ans. (a)

Q.9. A person qualified to perform electrical work must possess: -
(a) Skills/techniques to distinguish live parts from other parts of electrical equipment.
(b) Skills and techniques to determine the nominal voltage of exposed live parts.
(c) Knowledge on the use of PPE, insulating and shielding materials, and insulated tools.
(d) All of the above.

Q.10. Which IS is applicable for the portable Extinguishers for their performance and construction specifications?
(a) IS 325 (b) IS 15683 (c) IS 9001 (d) None of these

Section – B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

04X04 = 16 Marks

1. Why is it essential to provide earthing in electrical systems?

Ans. Earthing is the main avenue of safety in electrical systems. Proper earthing not only provides safety from shocks, it also provides stability to voltages, does not allow voltages to vary beyond certain limit, and aids protection provisions in solidly earthed system. Hence it is essential to provide proper earthing system.

2. Describe the hazards from electrical equipment.

Ans. Hazards from electrical equipment or installations may arise from:

1. The design, construction, installation, maintenance and testing of electrical equipment or electrical installations
2. Design change or modification
3. Inadequate or inactive electrical protection
4. Electrical equipment being used in an area in which the atmosphere presents a risk to health and safety from fire or explosion, for example confined spaces
5. Type of electrical equipment. For example, 'plug in' electrical equipment that may be moved around from site to site, including extension leads, are particularly liable to damage
6. The age of electrical equipment and electrical installations
7. Work carried out on or near electrical equipment or electrical installations, including electric overhead lines or underground electric services, for example work carried out in a confined space connected to plant or services.
8. Exposure to high electromagnetic fields may also present a potential hazard for workers with some medical conditions, for example pace makers.

3. Why is smoking prohibited in the battery charging areas?

Ans. Smoking is prohibited in battery charging areas because at certain points during the charging process, batteries emit a highly flammable combination of hydrogen and oxygen.

4. What do you understand by low, medium, high and extra high voltage?

Ans. Low voltage less than or equal 250 volts, medium voltage less than or equal 650 volts, high voltage less than or equal 33 kV and extra high voltage more than 33 kV.

Section – C

04X06 = 24 Marks

1. Which are the different types of extinguisher and where they are used?

Ans. There are four classes of fire extinguishers – A, B, C and D – and each class can put out a different type of fire.

- Class A extinguishers will put out fires in ordinary combustibles such as wood and paper
- Class B extinguishers are for use on flammable liquids like grease, gasoline and oil
- Class C extinguishers are suitable for use only on electrically energized fires
- Class D extinguishers are designed for use on flammable metals

Multipurpose extinguishers can be used on different types of fires and will be labeled with more than one class, like A-B, B-C or A-B-C.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

2. What will you do when an electrician suffered with an Electrical shock?

Ans.

If high-voltage electric shock happens to a worker on the job, trained employees should prepare to take the following steps:

1. Turn off or separate the victim from the electrical source. Unplug or shut off the power source. If turning off the power is not an immediate option, separate the person from the electrical source by using a dry, non-conducting object, such as a wooden broom, chair, or rubber doormat. Do not touch the victim.

2. Call 911 immediately. Even if the person does not appear hurt, they still need medical attention. If there is more than one person at the scene, steps 1 and 2 should be performed simultaneously to increase likelihood of survival.

3. Apply CPR, if needed. Only after being separated from the electrical source, check the victim's vital signs. Perform CPR or rescue breathing if breathing has stopped or seems slow.

4. Check for injuries. For burn marks, rinse with cold running water and cover with a loose, clean, lint-free bandage or cloth. If the victim is bleeding, apply pressure and elevate the wounded area if possible. If spinal injury is suspected from a fall, avoid moving the victim's head or neck.

5. Inform medical professionals once they arrive. Be specific about what happened and notify them of all injuries noticed.

In addition to first aid, take the time to recognize, evaluate, and control hazards before starting a job to create a safe working environment. Safety precautions should be combined with comprehensive insurance coverage that includes worker compensation benefits. This protects employees and avoids costly lawsuits and fines that can be devastating for your business.

3. What precautions to be taken for avoiding any electrical fire?

Ans. Any fire causes immense loss of property and life. Hence, due care should be taken to minimize the risk of fire so that fire does not start. Same is true in case of electrical fire.
If due care is taken while selecting equipment and installation methods, the possibility of electrical fire can be reduced to a very large extent.

Proper Material

Selection of Good Quality and proper material is essential as cheap and low quality material may not have good electrical & mechanical properties.
These can lead to faults. Also, new fire retardant, fire retardant low smoke or Halogen free fire resistant cables, wires are available. These can be used in high density areas. These materials emit lower smoke and also resist the propagation of fire.

Proper Installation Method

All openings in walls, beams, slabs used for carrying electrical systems/ cables/ wires etc. form one area to another must be sealed by fire retardant/ fire resistant material.
This can stop propagation of fire from one area to another. Vertical shafts in buildings must also be sealed at every level.
This stops the smoke from moving up as smoke is a major reason for fatalities in any fire.

Electrical Protection

Restrict electrical faults in the form of over load, short circuit protection, gas operated relays, over voltage protection, proper earthing and surge arrestors, earth leakage relays.

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Necessary protections as demanded by IS standards need to be employed at every level right from substation.

Proper selection of switch gear, EF and OC relays, relay settings, proper rating in terms of current carrying capacities & breaking capacities of MCCB's & MCB's exact OC relay ranges for motor feeders, Earth leakage detection devises where ever required should be employed.

All these protections either preempt the tripping before actual disastrous faults or restrict the electrical faults there by restricting damage to equipment and avoid fire.

Elaborate Pre-Commissioning testes of Pre-commissioning testing of entire electrical installation including continuity, insulation resistance.

Insulation strength, physical and functional checks, earthing resistance need to be done properly and as recommended.

Faulty material and installation can be detected prior to commissioning in most cases if proper testing is done. This avoids accidents both electrical & fire.

4. Write the safety instructions which have to be followed when working on a transformer.

Ans. . 1) When work is to be carried out on a transformer, both low and high tension breakers and isolators shall
be opened. Similarly, during isolation of transformers to which potential transformers are connected, such
potential transformers shall be isolated.

2) Before starting any work on a transformer installation, it is important to check carefully for back feed,
abnormal voltage or other dangerous conditions. Unusual circuit conditions may exist which require special consideration.

3) Whenever transformers are replaced, the new transformer should be checked carefully for voltage, polarity and phase sequence before taking into service.

4) Area should always be cordoned off & Safety tagging should be done prior to starting the job on transformer.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 1st / 3rd /5th Semester,

End – Sem. Make-up Examination of Open Elective Students

Course Code: ELE 1121 **Time: 2 Hours**

Course Name: Repairing and Servicing of Electrical Appliances **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. For which of the following 'ampere second' could be the unit?
   (a) Reluctance (b) Charge (c) Power (d) Energy

2. The different form of energy is:
   (a) Electrical Energy (b) Heat Energy
   (c) Atomic Energy (d) All of these

3. An electric current is the
   (a) flow of electrons (b) opposition to electrons
   (c) storage of charge (d) ionization of atom

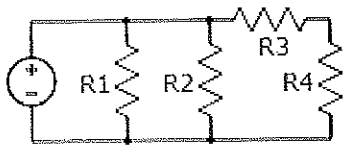
4. Megger is used to measure
   (a) Breakdown voltage of insulation (b) Earth resistance
   (c) Insulation resistance (d) None of the above

5. Current is measured by
   (a) Ammeter (b) Electrometer
   (c) Voltmeter (d) Ohmmeter

6. Megger will give resistance values which
   (a) Increase with the speed of the hand driven dynamo
   (b) Decrease with the speed of the hand driven dynamo
   (c) Remain constant irrespective of the speed
   (d) Any of the above

7. You have to replace 1500-ohm resistor in radio. You have no 1500-ohm resistor but have several 1000 ohm resistors. Which resistor combination you would connect
   (a) two in parallel (b) two in parallel and one in series
   (c) three in parallel (d) three in series

8. Identify the resistance in series



(a) R1-R2 (b) R2-R3

(c) R3-R4 (d) R1-R3

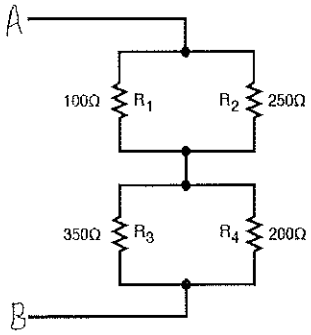
9. All of the following are equivalent to watt except
   (a) (amperes)^2 ohm (b) joules/sec.
   (c) amperes x volts (d) amperes/volt

10. What will be the reading of megger if the measuring terminals are open circuited?
    (a) Infinity (b) 500 ohms (c) Zero (d) 10,000 ohms

Section – B

04X04 = 16 Marks

1. Differentiate between electric charge and current.
2. Find out the equivalent resistance-



3. What is the use of Multimeter? Mention its various parts.
4. Why safety is necessary in repairing of electrical appliances? Comment.

Section – C

04X06 = 24 Marks

1. What are possible problems associated with ceiling fan which is not working? Provide possible solutions for those problems.
2. What is electric water heater? What is the use of thermostat in water heater? Explain its operation with diagram.
3. What is a megger? Explain the working with schematic diagram.
4. Calculate equivalent resistance R_{eq} between the points A and B for the following resistor combination circuit-