Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

3rd Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: ELE1301 **Time: 1 Hour**

Course Name: Electrical Assembly Operator Control Panel **Max. Marks: 20**

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

Section – A

05X01 = 05 Marks

Q.1. The full form of ISO is:
(a) Indian Standard Organization (b) International Standard organization
(c) International Organization for Standardization (d) None of These

Q.2. Which of the following is a valid straight rating for a power supply?
(a) 208Y/120V (b) 240Y/131V (c) 480Y/277V (d) None of These

Q.3. A safety transformer is used in:
(a) protective extra low voltage circuit (b) protective extra high voltage circuit
(c) protective low voltage circuit (d) protective high voltage circuit

Q.4. Starting from the load, all products above the first branch circuit protective device is called:
(a) Feeder Circuit (b) Branch Circuit (c) Control Circuit (d) None of these

Q.5. "Slash rating" refers to:
(a) A solidly grounded wye (b) Delta systems
(c) Ungrounded wye systems (d) None of These

Section – B

03X02 = 06 Marks

Q.1. What do you mean by electrical assembly operator?

Q.2. Write a short note on Insulating barriers.

Q.3. What is meant by an Electric Hazard? What are the types of Electric Hazards?

Section -- C

03X03 = 09 Marks

Q.1. Write a short note on feeder circuit and branch circuit with the help of a suitable diagram.

Q.2. Explain about the requirements of Incoming supply circuit and disconnecting means.

Q.3. Derive the expression for the relationship between Line voltage and Phase voltage for a "wye" connected system and comment about slash rating.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
3rd Semester, 1st In-Sem. Examination
B. Voc. Program, Winter Semester (2018-19)

Course Code: ELE1301
Course Name: Electrical Assembly Operator Control Panel **Max. Marks: 20**

Section – A

05X01 = 05 Marks

Q.1. The full form of ISO is:
(a) Indian Standard Organization (b) International Standard organization
(c) International Organization for Standardization (d) None of These
Ans. (c)

Q.2. Which of the following is a valid straight rating for a power supply?
(a) 208Y/120V (b) 240Y/131V (c) 480Y/277V (d) None of These
Ans. (d)

Q.3. A safety transformer is used in:
a. protective extra low voltage circuit b. protective extra high voltage circuit
c. protective low voltage circuit d. protective high voltage circuit
Ans. (a)

Q.4. Starting from the load, all products above the first branch circuit protective device is called:
(a) Feeder Circuit (b) Branch Circuit (c) Control Circuit (d) None of these
Ans. (a)

Q.5. "Slash rating" refers to:
(a) A solidly grounded wye (b) Delta systems
(c) Ungrounded wye systems (d) None of These
Ans. (a)

Section – B

03X02 = 06 Marks

Q.1. **What do you mean by electrical assembly operator?**

Ans. The electrical assembly operator is responsible for making electrical connections of the control panel assembly.
The individual at work mounts, connects and installs the internal electronic modules devices and components on the control panel.
The individual must have the ability to work in high decibel noise environments and in standing positions for long hours.

Q.2. **Write a short note on Insulating barriers?**

Ans. One of the reasons insulating barriers are constructed is to increase the over surface or through air spacings between phases. The insulating material shall comply with all the following requirements:
The insulating material shall either be a material included in the table "Generic materials for use as barriers" below, or it shall comply with one of the following requirements:
Electrical sleeving
Insulating tubing
Wrapping consisting of at least two layers of insulating tape
The rated values of the insulating material are suitable for direct contact with the relevant live parts.
The insulating material itself is only used for insulation purposes and not as a load-bearing design part.

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Q.3. **What is meant by an Electric Hazard? What are the types of Electric Hazards?**

Ans. "Electrical hazards" is taken to mean events of an electrical nature that pose a hazard to people. The essential ones to list here are electric shock and arcing faults. NFPA 79, requires electrical equipment to protect people from the following hazards:

- Electric shock due to direct or indirect contact
- Arc flashing

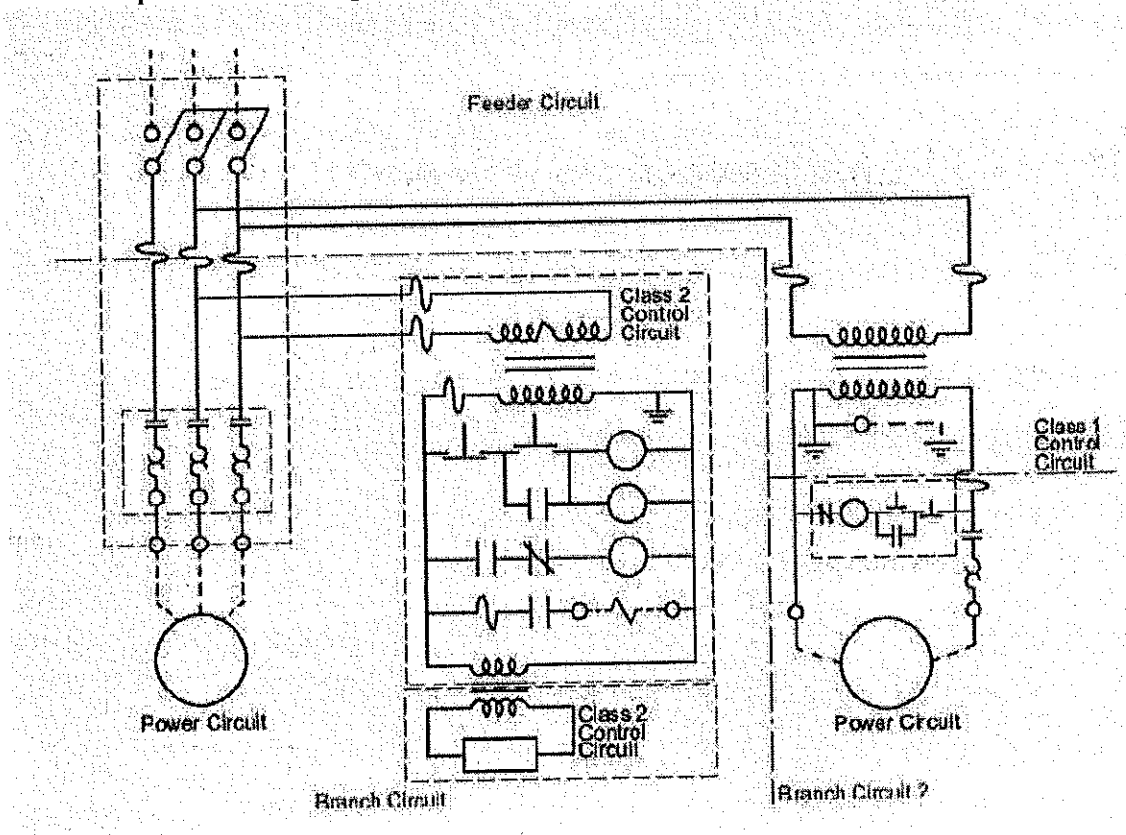
Section – C

03X03 = 09 Marks

Q.1. Write a short note on feeder circuit and branch circuit with the help of a suitable diagram?

ANS:

- ✓ Feeder circuit: All conductors between the incoming supply and the branch circuit protective device.
- ✓ Feeder circuit: The conductors and circuitry on the supply side of the branch circuit protective device.
- ✓ Branch circuit: The circuit conductors between the branch circuit protective device and the outlets.
- ✓ Branch circuit: The conductors and components following the last branch circuit protective device protecting a load.



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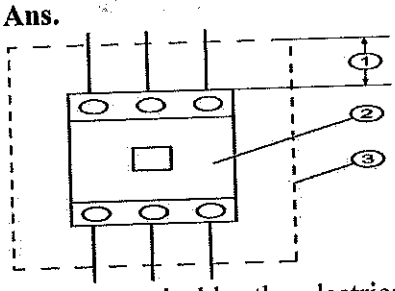
Q.2. Explain about the requirements of Incoming supply circuit and disconnecting means.

Ans.



- ✓ Where practicable, the electrical equipment of a machine shall be connected to a single power supply circuit.
- ✓ Where it is necessary to use another supply circuit for certain parts of the equipment (e.g., electronic circuits, electromagnetic clutches), that supply circuit shall, as far as practicable, be derived from devices (e.g., transformers, converters) forming part of the electrical equipment of the machine.
- ✓ The incoming supply circuit conductors shall be terminated at the supply circuit disconnecting means, where practicable. Connections to terminals ahead of the disconnecting means shall be permitted only for excepted circuits (lighting, maintenance, etc.) or for other incoming supply circuit conductors.
- ✓ **Note :** The required through air and over surface spacing's shall be observed, since a feeder circuit is present.
- ✓ Terminals suitable for more than one conductor shall be so identified.
- ✓ Grounded conductors shall be marked and connected to a separate terminal.
- ✓ Terminals for each incoming supply circuit shall be clearly marked and correspond with markings in the technical documentation.
- ✓ The wire-bending space provided between the terminals of the supply circuit and the wall of the enclosure shall be observed in accordance with NEC.
- ➢ According to NFPA 79, each incoming supply circuit shall be provided with its own disconnecting means.
- ➢ The disconnecting means shall switch off all electric circuits, including the control circuits.
- ➢ **Condition**
- ➢ The disconnecting means for the incoming supply circuit(s) shall be fitted with an external handle and meet the following conditions:
- ➢ When operated vertically, the "up" position of the handle shall be the "on" position. (UL 508A, Chapter 30.4.1)
- ➢ The "on" and "off" positions shall be clearly marked. (UL 508A, Chapter 30.4.2 and NFPA 79, Chapter 5.3.3.1 (7))
- ➢ Where two or more main disconnecting means are provided, they shall be grouped in one location where practicable
- ➢ The operating handle shall be capable of being locked in the "off" position.
- ➢ An operating mechanism (handle) shall be readily accessible (and operable) with the door in the open or closed position.
- ➢ The disconnecting means shall be operable and lockable independent of the door position.

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Q.3. Derive the expression for the relationship between Line voltage and Phase voltage for a "wye" connected system and comment about slash rating.

Ans.

$$\text{Magnitude of } V_{RY} = \sqrt{V_{RN}^2 + V_{YN}^2 + 2V_{RN}.V_{YN}\cos 60^\circ}$$

$$= \sqrt{V_{RN}^2 + V_{YN}^2 + 2V_{RN}.V_{YN}.\frac{1}{2}}$$

$$= \sqrt{V_{RN}^2 + V_{YN}^2 + 2V_{RN}.V_{YN}}$$

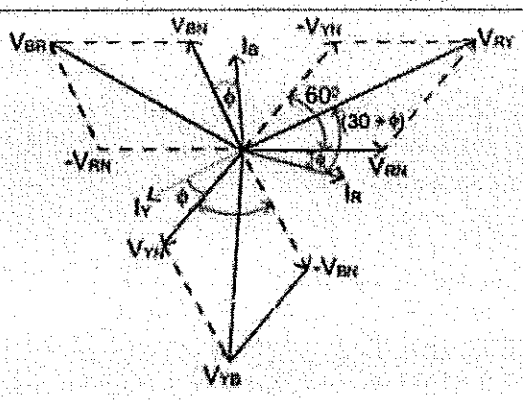
$$But\ V_{RN} = V_{YN} = V_{ph}.$$

$$V_{RY} = V_L$$

$$V_{RY} = \sqrt{V_{ph}^2 + V_{ph}^2 + 2V_{ph}.V_{ph}}$$

$$= \sqrt{3}.V_{ph}.$$

$$\therefore V_{ph} = \frac{V_{RY}}{\sqrt{3}} = \frac{V_L}{\sqrt{3}}$$



Similarly
VYB = √3 Vph
VBR = √3 Vph
VYB = VBR = VL
VL = √3 Vph

$$V_{ph} = \frac{V_L}{\sqrt{3}}$$

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

3rd Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: ELE1302 **Time: 1 Hour**

Course Name: Electrical Design Developer **Max. Marks: 20**

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

Section – A

05X01 = 05 Marks

Q.1. Permeability in a magnetic circuits corresponds to_____ in electrical circuits.
(a) resistance (b) resistivity (c) conductivity (d) conductance

Q.2. CRGO means:
(a) Cold Rolling Grain Oriented (b) Cold Rolled Grain Optimization
(b) (c) Carbon Rolling Grain Oriented (d) Cold Rolled Grain Oriented

Q.3. The relative permeability of ferromagnetic material is:
(a) Less than 1 (b) More than 1 (c) More than 10 (d) More than 100 or 1000

Q.4. The relation between magnetic field density and magnetic field intensity is given by:
(a) $B=\mu H$ (b) $H=\mu B$ (c) $B=\lambda H$ (d) $B.H=\mu$

Q.5. Number of field lines passing at certain area are known as:
(a) Electric field (b) electric flux (c) electrostatics (d)electric field lines

Section – B

03X02 = 06 Marks

Q.1. Explain Ampere's Law in detail.

Q.2. What are the limitations associated with the installation of machine design?

Q.3. Consider a coil having turns (N)=25. The toroid, on which the coil is wound, has an inside diameter of 5cm and outside diameter of 5.5cm. For current (i)= 3A, calculate the magnetic field intensity.

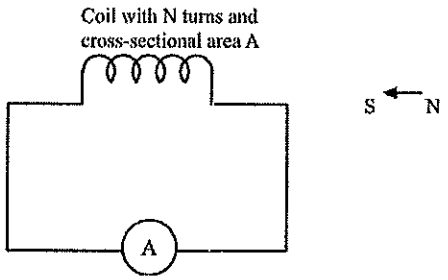
Section – C

03X03 = 09 Marks

Q.1. State Faraday's Law of electromagnetic induction in words and write down a mathematical relationship.

Q.2. Discuss the differences between Diamagnetic, Paramagnetic and Ferromagnetic materials.

Q.3. Define Fleming right hand rule. Use the Right Hand Rule to determine the direction of the induced current in the solenoid below.



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

3rd Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: ELE1302

Course Name: Electrical Design Developer **Max. Marks: 20**

Section – A 05X01 = 05 Marks

Q.1. Permeability in a magnetic circuits corresponds to_____ in electrical circuits.

(a) resistance (b) resistivity (c) conductivity (d) conductance

Ans. (c)

Q.2. CRGO means:

(a) Cold Rolling Grain Oriented (b) Cold Rolled Grain Optimization

(c) Carbon Rolling Grain Oriented (d) Cold Rolled Grain Oriented

Ans. (d)

Q.3. The relative permeability of ferromagnetic material is:

(a) Less than 1 (b) More than 1 (c) More than 10 (d) More than 100 or 1000

Ans. (d)

Q.4. The relation between magnetic field density and magnetic field intensity is given by:

(a) $B=\mu H$ (b) $H=\mu B$ (c) $B=\lambda H$ (d) $B.H=\mu$

Ans. (a)

Q.5. Number of field lines passing at certain area are known as:

(a) Electric field (b) electric flux (c) electrostatics (d)electric field lines

Ans. (b)

Section – B 03X02 = 06 Marks

Q.1. Explain Ampere's Law in detail.

Ans. Ampere's Law states that for any closed loop path, the sum of the length elements times the magnetic field in the direction of the length element is equal to the permeability times the electric current enclosed in the loop.

Ampere's circuital law states that the line integral of the magnetic field $\vec{H}$ (circulation of H) around a closed path is the net current enclosed by this path. Mathematically,

$$\oint \vec{H}.d\vec{l} = I_{enc} \quad \text{.....(1)}$$

The total current I enc can be written as,

$$I_{enc} = \int_S \vec{J}.d\vec{s} \quad \text{.....(2)}$$

By applying Stoke's theorem, we can write

$$\oint \vec{H}.d\vec{l} = \int_S \nabla \times \vec{H}.d\vec{s}$$

$$\therefore \int_S \nabla \times \vec{H}.d\vec{s} = \int_S \vec{J}.d\vec{s}$$

$$\therefore \nabla \times \vec{H} = \vec{J} \quad \text{.....(3)}$$

which is the Ampere's law in the point form.

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Q.2. What are the limitations associated with the installation of machine design?

Ans. Saturation: Higher denseness decreases the degree of iron however drives the iron to work on the far side knee of the magnetization curve or within the area of saturation. Saturation of iron poses a limitation on account of magnified core loss and excessive excitation needed to ascertain a desired value of flux. It conjointly introduces harmonics.

- **Current density:** Greater current density diminishes the volume of copper however will increase the losses and temperature.
- **Temperature:** postures a limitation on account of doable harm to insulation and different materials.
- **Insulation** (which is each automatically and electrically weak): postures a limitation on account of breakdown by too much voltage gradient, mechanical forces or heat.

Q.3. Consider a coil having turns (N)=25. The toroid, on which the coil is wound, has an inside diameter of 5cm and outside diameter of 5.5cm. For current (i)= 3A, calculate the magnetic field intensity.

Ans. $H=Ni/L_m$

$L_m= 2*pi*r_m$

r_m = (Outer Diameter+Inner Diameter)/2

$r_m = (5+5.5)/2 = 5.25cm$

r_m 0.0525m.

$H_m = (25*3)/ 0.0525$

$H_m = 1428.57$ A/m

Section – C 03X03 = 09 Marks

Q.1. State Faraday's Law of electromagnetic induction in words and write down a mathematical relationship.

Ans. Faraday's law, due to 19th century physicist Michael Faraday. This relates the rate of change of magnetic flux through a loop to the magnitude of the electro-motive force E induced in the loop. The relationship is

$E=d\Phi/dt$

The electromotive force or EMF refers to the potential difference across the unloaded loop (i.e. when the resistance in the circuit is high). In practice it is often sufficient to think of EMF as voltage since both voltage and EMF are measured using the same unit, the volt.

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Q.2. Discuss the differences between Diamagnetic, Paramagnetic and Ferromagnetic materials.

Ans. Diamagnetic Material

A material that turns at a right angle to the field by producing a magnetic response opposite to the applied field is called diamagnetic material such as silver, copper, and carbon have permeability's slightly less than free space (for copper, μ_r= 0.9999980).

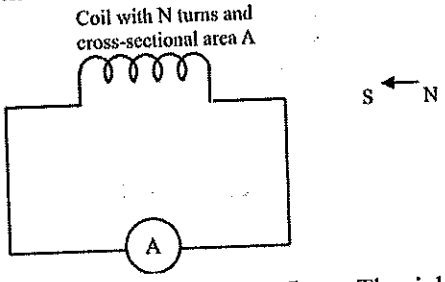
Paramagnetic Material

A material aligning itself with the applied field is called paramagnetic material. Paramagnetic materials such as aluminum and air have permeability's slightly greater than that of free space (for air μ_r =1.0000004). The effects of diamagnetic and paramagnetic are negligibly small so that materials possessing these weak phenomena are said to be non-magnetic.

Ferromagnetic Material

Within the paramagnetic class of materials, is a special classification of materials called ferromagnetic material. These materials are strongly attracted to magnets and exhibit Paramagnetism to a phenomenal degree. Ferromagnetic materials such as iron, steel, cobalt and their alloys have relative permeability's extending into the hundreds and thousands, are said to be magnetic.

Q.3. Define Fleming right hand rule. Use the Right Hand Rule to determine the direction of the induced current in the solenoid below.



Ans. Fleming's right-hand rule gives which direction the current flows. The right hand is held with the thumb, index finger and middle finger mutually perpendicular to each other (at right angles), as shown in the diagram. The thumb is pointed in the direction of the motion of the conductor relative to the magnetic field.

From the below figure, the motion of the bar magnet is right to left, so the direction of thumb according to the rule is in left direction and the current is going inside the paper plane.

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

3rd Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: ELE1303 **Time: 1 Hour**

Course Name: Safety Electrical Installation Controller **Max. Marks: 20**

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

Section – A

05X01 = 05 Marks

Q.1. Who is responsible for your safety at work?

(a) Your employer (b) Your Staffing agency (c) You (d) All of these

Q.2. Most common categories of risk and causes of accidents at work are:

(a) Slips, trips and falls (b) Put guards around the hazard

(c) Use safe system of work (d) None of these Human body can withstand

Q.3. For any fire to continue to burn, three components must be present. These are:

(a) Fuel, oxygen and heat (b) Fuel, wood and cardboard

(c) Flames, fuel and heat (d) Petrol, oxygen and bottled gas

Q.4. Under the health and safety at work act an employer is responsible for:

(a) Maintaining plant and equipment (b) Providing PPE

(c) Wearing PPE (d) Both (a) and (b)

Q.5. Under the health and safety at work act an employee is responsible for:

(a) Maintaining plant and equipment (b) taking responsible care to avoid injury

(c) Wearing PPE (d) Both (b) and (c)

Section – B

03X02 = 06 Marks

Q.1. Differentiate between risk and hazard.

Q.2. What is PPE? Why PPE is necessary at work place?

Q.3. What are the immediate and ultimate objectives of an accident investigation?

Section – C

03X03 = 09 Marks

Q.1. State basic electrical safety rules.

Q.2. Explain the effect of electric current on human body.

Q.3. Why most electrical accident occurs? How can we prevent these accidents?

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

3rd Semester, 1st In-Sem. Examination

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Course Code: ELE1303 **Time: 1 Hour**

Course Name: Safety Electrical Installation Controller **Max. Marks: 20**

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Section – A

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Section – B

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Q.2. Explain the effect of electric current on human body.

Q.3. Why most electrical accident occurs? How can we prevent these accidents?

Solution

Course Name :- Electrical installation Controller
Course Code :- ELE1303

Section - A

1. Ans → (d) → (1 M)
2. Ans → (a) → (1 M)
3. Ans → (a) → (1 M)
4. Ans → (d) → (1 M)
5. Ans → (d) → (1 M)

Section - B

Ans: Hazard is any thing which might cause harm. workplace hazards can come from wide range of sources, includes any substance, material, process etc. that has ability to cause harm or adverse health effect to a person. → (1 M)

Risk is the chance of harm that could occur from a particular hazard. The factors that influence the degree of risk depends upon how much a person is exposed to a hazardous thing or condition. → (1 M)

2. Ans:-

PPE is defined as all equipment design to be worn, or held, to protect against a risk to health and safety. this includes most type of protective clothing and equipment such as eye, foot and head protection, safety harnesses, life jackets and high visibility clothing. →(1M)

the necessity of PPE at work place is understand by following examples

ex:- (i) object falling from a height present the major hazard against which head protection is provided. the head protection include helmets etc.

(ii) Eye protectors like safety spectacles, safety goggles, face shields are provided to become shape from flying particles, light emissions etc. →(1M)

3. Ans:

the immediate objective is to get accurate information about the cause and circumstances of accident. →(1M)

the ultimate objective is to prevent future reoccurances

v) Avoid jokes at work place:—
Don't be the cause of someone being injured or killed and do not let someone else be cause of your being injured or killed.
→ (0.5M)

2. Ans:

It is not easy to say how much that current will flow through the human body because different people have different resistances. A body has less resistance in hot day when sweating occurs, because salt water is very good conductor.

When we talk about effect of electrical current on human body, a current of 2 to 3 milliamperes (0.002 to 0.003 amp) usually causes slight tingling sensation, which increases as current increases and become very noticeable at about 10 milliamperes. The tingling → (1.5M) sensation is very painful at about 20 milliamperes. current between 30 and 40 milliamperes cause muscular paralysis and these between 40 and 60 milli-amperes cause breathing difficulty. When current increases to about

of similar accidents, to uncover new hazards, and to devise method to control these hazards. → (1M)

Section-C

1. Ans:

The basic safety rules are as follows.

I) Never work on an energized circuit. → (0.5 M)

II) Do not work alone :- this is especially true when working in a hazardous location or on a live circuit, have someone with you who can turn off the power during accident occurs → (0.5M)

(III) Work with one hand when possible- the worst kind of electrical shock occurs when the current path is from one hand to other, which permits the current to pass directly from heart → (0.75M)

IV) Learn first Aid :- Anyone working on electrical equipment should make effort to learn first Aid. A knowledge of first Aid might save your own or someone elses life. → (0.75M)

100 milliamperes, breathing is extremely difficult. current from 100 to 200 milliamperes generally cause death because the heart usually goes into fibrillation, a condition in which heart begin to quiver and the pumping action stops. → (1.5m)

3. Ans:

Most electrical accidents result from one of the following three factors:-

i) Unsafe equipment or installation
ii) unsafe environment
iii) Unsafe work practices
→ (1.5m)

Some ways to prevent these accidents are through the use of insulation, guarding, grounding, electrical protective devices and safe work practices.
→ (1.5m)