BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

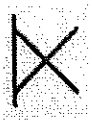
1st In-Sem. Examination

Course Code: ELE1101 **Time: 1 Hour**

Course Name: Construction Electrician **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

1. What is the unit of conductivity?
   (a) Ω·m (b) Ω/m (c) $(\Omega \cdot m)^{-1}$ (d) None of these
2. Which is the symbol of lamp mounted on the wall?
   (a)  (b)  (c)  (d) 
3. NEC stands for:
   (a) National Economic Council (b) National Electrical Code
   (c) No Existing Category (d) National Earthing Center
4. What is the colour of earthing wire in the electrical cable.
   (a) Yellow (b) Red (c) Green (d) Gray
5. How much voltage is there in single phase AC supply in India?
   (a) 240 Volts (b) 110 Volts (c) 50 Volts (d) 440 Volts

Section – B

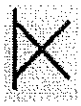
1. What is the resistivity?
2. Write the uses of phase tester and pipe cutter tools.
3. Differentiate between conductor and insulator with examples.

Section – C

1. Explain mounting levels of the accessories and cables as recommended in BIS and NEC.
2. What is the conduit wiring? Describe its advantages and disadvantages.
3. Explain any six types of plug and socket.

Answer Key Set - A
Course Code: ELE1101, Course Name: Construction Electrician
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, First Semester, 1st In-Sem. Examination

Section - A

Ans 1. (c) $(\Omega \cdot m)^{-1}$.
Ans 2. (d) 
Ans 3. (b) National Electrical Code
Ans 4. (c) Green

Ans 5. (a) 240 Volts

Section - B

Ans 1. The electrical resistivity of a material may also be known as its specific electrical resistance. It is a measurement of how strongly a material opposes the flow of electric current. "It is the ability of a material to resist the electric current". It is denoted by Rho (ρ).
The unit of resistivity is ohm meter (Ω·m).

Ans 2.
Phase tester: The tip of the **tester** is touched to the conductor being tested (for instance, it can be used on a wire in a switch, or inserted into a hole of an electric socket). A neon lamp takes very little **current** to light, and thus can use the user's body capacitance to earth ground to complete the circuit.

Pipe cutter: A **pipe cutter** is a tool used to cut pipes. Besides producing a clean cut, the tool is often a faster, cleaner, and more convenient way of cutting pipe than using a hacksaw, although this depends on the metal of the pipe.

Ans 3.
Conductor: A conductor is an object or type of material that allows the flow of an electrical current by using free electron of conductors. Materials which made of metal are common electrical conductors.
Some common conductors are copper, aluminium, gold, silver and iron.
Insulator: Non-metallic solids are said to be good insulators, having extremely high resistance to the flow of charge through them. Most atoms hold on to their electrons tightly are called insulators.

Some common insulators are glass, air, plastic, rubber, and wood.

Section - C

Ans 1.
- Height of the main and branch distribution boards not be more than 2 m from the floor level. A front clearance of 1 m should also be provided.
- All the lighting fittings shall be at a height of not less than 2.25 m from the floor.
- A switch shall not be installed at any height up to 1.3 m above the floor level.
- Socket outlets shall be installed either 0.25 or 1.3 m above the floor as desired.
- The clearance between the bottom point of the ceiling fan and the floor shall be not less than 2.4 m. The minimum clearance between the ceiling and the plane of the blades of the fan shall not be less than 300 mm.

- The cables shall be run at any desired height from the ground level, and while passing through floors in the case of PVC casing and capping and T R S wiring, it shall be carried in heavy gauge conduit.

Ans 2.

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

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

Disadvantages

1. Expensive as compared to surface conduit wiring
2. Changing the location of switches or appliances is difficult
3. Installation is complex
4. Hard to find defects in the wiring
5. Adding additional conduit in future is a tedious task

Ans 3.

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)

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, I Semester,

1st In-Sem. Examination

Course Code: ELE1102 **Time: 1 Hour**

Course Name: Electrical Drawing **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

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 the above

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 the above

Section – B

03X02 = 06 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

Section – C

03X03 = 09 Marks

1. Write down the objective of Electrical Drawing.
2. Differentiate between circuit diagram and wiring diagram.
3. What are the benefits of CAD software?

Answer Key Set A – B

Course Code: ELE1102, Course Name: Electrical Drawing

School of Electrical Skills, Session: 2020-21 (Summer Semester)

B. Voc. Program, I Semester, 1st In-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

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.

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.

Electrical

8. (a) There are ---------- levels of counseling.

   (b) Intelligence tests may be classified under ---------- categories.

9. (a) Performance tests are administered on the ---------- persons.

   (b) Cattel has described the ---------- personality factors.

10. (a) First cumulative record was made by American Council of ---------- .

    (b) ---------- maintains the cumulative record in school.

Section B

(4X5=20)

11. Explain the needs of personal guidance in detail.
12. Write a short note on preparatory service.
13. How guidance is different from counseling? Explain.
14. Explain the nature of guidance in detail.
15. Describe cumulative record in detail.
16. Write a short note on Directive Counseling.

Section C

(2X10=20)

17. Discuss objectives and functions of guidance at different levels.
18. Discuss needs of guidance in detail.
19. What is meant by vocational guidance? Explain various sources of vocational information in India.

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. The benefits of CAD software are:

- Improved productivity in drafting.
- Shorter preparation time for drawing.
- Reduced manpower requirements.
- Customer modifications in drawing are easier.
- More efficient operation in drafting.
- Low wastage in drawing.
- Minimized transcription errors in drawing.
- Improved accuracy of drawing.
- Assistance in preparation of documentation
- Better designs can be evolved.

Electrical

Enrollment No.....

SCHOOL OF POLYMECHANIC
FIRST IN-SEMESTER EXAMINATION- 2017
B.VOC. COURSE

Sub. Code: EB-214
Sub. Name: Educational and Vocational Guidance

Time: 3 Hours
Max. Marks: 50

Instructions: Answer all questions from Section A, each question carries one mark. Answer any four questions from Section B, each question carries 05 marks. Answer any two questions from Section C, each question carries 10 marks.

Section-A **(10X1=10)**

1. (a) Guidance is both formal and.....

   (b) Guidance is a dynamic and ---------- process.

2. (a) Guidance is provided both individually and .....

   (b) Educational guidance is a ---------- process.

3. (a) The service, which keeps in touch with the students who passed out of school, is..... service.

   (b) Counseling is a ---------- relationship.

4. (a) Guidance is the development of capacities. (True/ False)

   (b) Case study technique is used in ..... Guidance.

5. (a) The chief protagonist of directive counseling is .....

   (b) Counseling is interviews helps pupils to make a right choice. (True/ False)

6. (a) The non-directive counseling is also known as .....

   (b) The extended form of SCERT is .....

7. (a) The extended form of NCO is .....

   (b) The family problem falls in the area of ---------- guidance.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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

Course Code: ELE 1103 **Time: 1 Hour**

Course Name: Basic Electrical Engineering **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

1. The symbol of resistor is:

   (a)  (b)  (c)  (d) None of these

2. The unit of power is:

   (a) W (b) Wh (c) A (d) V

3. Rate of flow of electric charge in an electric circuit is known as:

   (a) Voltage (b) Current (c) Power (d) Energy

4. The mass of neutron is _____ Electron.

   (a) less than (b) greater than (c) equal to (d) None of these

5. In an atom particles having positive charge is called:

   (a) Proton (b) Neutron (c) Electron (d) None of these

Section – B

03X02 = 06 Marks

1. What do you mean by Electric Power?
2. What do you mean by a Resistance?
3. Briefly define Electricity.

Section – C

03X03 = 09 arks

1. State and explain Kirchhoff's Voltage Law.
2. State and explain Ohms law.
3. 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	

A

Answer Key Set – A

Course Code: ELE 1103, Course Name: Basic Electrical Engineering

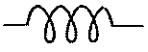
School of Electrical Skills, Session 2020-21 (Summer Semester)

B. Voc. Program 1st Semester, 1st In-Sem. Examination

Section – A

05X01 = 05 Marks

1. The symbol of resistor is.....?

   a.  b.  c.  d. None of these

2. The unit of power is.....?.

   a. **W** b. Wh c. A d. V

3. Rate of flow of electric charge in an electric circuit is known as .....?

   a. Voltage b. **Current** c. power d. Energy

4. The mass of neutron is .... electron ?

   a. less than b. **greater than** c. equal to d. none of these

5. In an atom particles having positive charge is called .....?

   a. **Proton** b. Neutron c. Electron d. None of these

Section – B

03X02 = 06 Marks

1. What do you mean by Electric Power?

   Electric power is the rate of energy consumption in an electrical circuit.

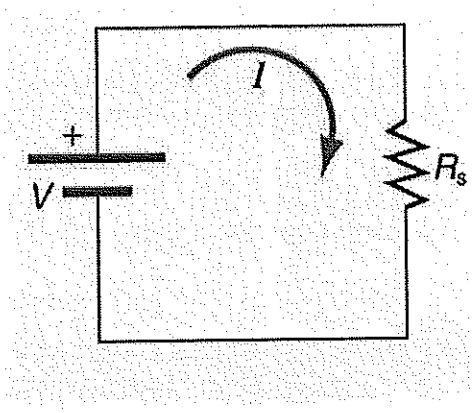
   Electric power is the rate at which energy is transferred to or from a part of an electric circuit

   The electric power is measured in units of watts.

   General form:

   electric power = Potential difference x current

   P = VI



2. What do you mean by a resistance?

- Resistance is the 'opposition' to the current flow measured in ohms (Ω)
- Conductors have a low value of resistance
- Insulators have a very high resistance
- Load in DC/AC circuits

3. Briefly define Electricity?

   Electricity is a form of energy. Electricity is the flow of electrons. All matter is made up of atoms, and an atom has a center, called a nucleus. The nucleus contains positively charged particles called protons and uncharged particles called neutrons. The nucleus of an atom is surrounded by negatively charged particles called electrons. The negative charge of an electron is equal to the positive charge of a proton, and the number of electrons in an atom is usually equal to the number of protons. When the balancing force between protons and electrons is upset by an outside force, an atom may gain or lose an electron. When electrons are "lost" from an atom, the free movement of these electrons constitutes an electric current.

Section – C

03X03 = 09 arks

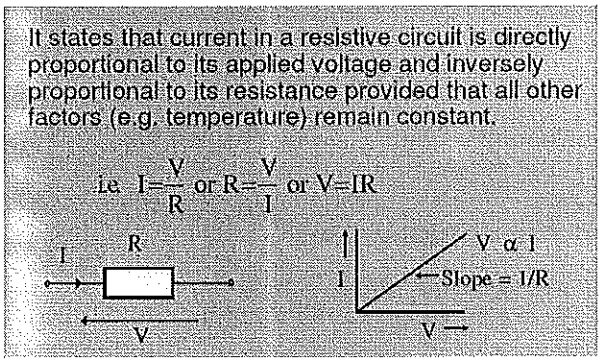
1. State and explain Krichhoff's Voltage Law?

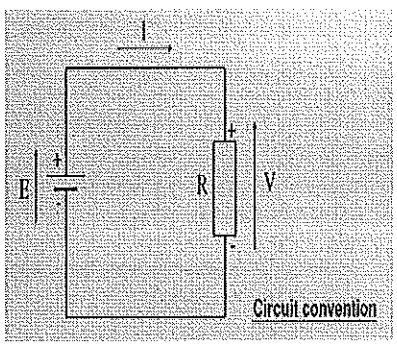
   KVL states that *the algebraic sum of the voltages between successive nodes in a closed path in a circuit is equal to zero*

   Or

   Algebraic sum of all the voltages in a closed electrical circuit is equal to zero.

2. State and explain Ohms law?





Answer Key Set – A

Course Code: ELE 1103, Course Name: Basic Electrical Engineering

School of Electrical Skills, Session 2020-21 (Summer Semester)

B. Voc. Program 1st Semester, 1st In-Sem. Examination

3. 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

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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

Course Code: ELE1104 **Time: 1 Hour**
Course Name: Maintenance Technician Electrical **Max. Marks: 20**
Instruction: All questions are compulsory. Each question carries one mark in section A. Each question carries two marks in section B. Each question carries three marks in section C. Scientific calculator is allowed.

Section – A

05x01 = 05 Marks

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

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

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

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

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

Section – B

03x02 = 06 Marks

1. What is the difference between mallet and cross peen hammer?
2. Write down the names of 10 electrician hand tools which are used for house wiring.
3. List 2 electrician tools and briefly describe their use.

Section – C

03x03 = 09 Marks

1. Define preventive maintenance. What are the advantages of preventive maintenance.
2. What are various items used in Preventive Maintenance. List out 15 of them.
3. Explain in brief 7 steps of troubleshooting?

A

Answer Key Set – A

Course Code: ELE1104, Course Name: Maintenance Technician Electrical
School of Electrical Skills, Session: 2020-21 (Summer Semester)
B. Voc. Program, 1st Semester, 1st In-Sem. Examination

Section – A

05x01 = 05 Marks

Ans. 1: (b)
Ans. 2: (d)
Ans. 3: (a)
Ans. 4: (Cable Stripper)
Ans. 5: (Spirit Level)

Section – B

03x02 = 06 Marks

Ans. 1: - Mallet is used for beating soft metals and wooden pieces/jobs while the hammer is used for putting gitti in walls, fix clips into walls and beating hard metals that require more force.

Ans. 2: -1. Combination plier 2. Nose plier 3. Side cutting plier 4. Wire stripper
5. Cable stripper 6. Crimping tool 7. Pipe cutter 8. Step drill bit
9. Mallet 10. Flat file

Ans. 3: - 1. Adjustable plier: This plier is used for turning and holding nuts and bolts, gripping irregularly shaped objects and clamping materials. It also contains an adjustable jaw which can be adjusted according to the requirement of the job.

2. Crimping tool: It is a tool used to join two pieces of metal by deforming one or both of them in a way that causes them to hold each other. In other words, its used to join lugs in wires.

Section – C

03x03 = 09 Marks

Ans. 1: - Preventive maintenance can be described as maintenance of equipment or systems before fault occurs. Preventive maintenance is conduct to keep equipment working or extend the life of equipment. Preventive maintenance is applied by technician's teams and managers before any breakdown or failure occurs. Its aim is to reduce the probability of breakdown or degradation of a piece of equipment, component or spare part. In order to implement such maintenance, teams have to take the part's history into consideration and keep track of the past failures. They are therefore able to identify the time ranges during which a piece of equipment might break down.

Advantage of Condition based Preventive maintenance are:

1. CBM is performed while the asset is working, which lessens the chances of disruption to normal operations
2. Reduces the cost of asset failures
3. Improves equipment reliability
4. Minimizes time spent on maintenance
5. Minimizes overtime costs by scheduling the activities
6. Minimizes requirement for emergency spare parts
7. Improves worker safety
8. Reduces the chances of collateral damage to the system

spectra received by earth is known as AM 1 spectrum. Terrestrial solar cell efficiencies are reported under AM 1.5 (global) conditions.

1.3 Photovoltaic conversion

The process of conversion of light into direct electricity involves three important steps namely (a) generation of free charge carriers (b) separation of carriers and (c) collection of separated carriers.

When light with photon energy (hv) greater than the band gap (E_g) of the semiconductor is incident on it, it gets absorbed creating free electrons and free holes. The generated charge carriers due to this optical excitation should be separated before they recombine. For this a built-in electric field at an interface within the semiconductor (formed due to different doping regions like p and n or due to the electron concentration difference in between a metal and the semiconductor etc.) is required. Photo-generated carriers created close to the junction/interface get separated due to the built-in electric field at the junction. The separated carriers should be effectively collected by proper contacts for photovoltage and photocurrent to be observed.

(a) Types of interfaces

The built-in electric field to separate the photo-generated carriers is achieved mostly through the formation of (i) p-n homojunction (ii) p-n heterojunction and (iii) Schottky barrier

(i) Homojunction

It is a metallurgical interface formed between p and n regions of the same semiconductor. The examples for p-n homojunction solar cells are Si and GaAs. In general, p-n homojunction solar cells exhibit high efficiency, particularly in direct band gap materials with high absorption coefficient but there are appreciable losses like front surface recombination losses.

Ans. 2: -

1. All lights working properly
2. Glassware conditions
3. Fixture hardware conditions
4. Wire connections
5. Ballast conditions
6. Broken/Damaged wires
7. Installation according to standards
8. Number of exits in case of emergency
9. Presence of any foreign material near systems
10. Space for hands for maintenance purpose
11. Hand space occupied by foreign material/used for storage
12. Outlet/inlet cord conditions
13. Distribution box condition
14. Use of proper tags at dangerous locations
15. Space for illumination near maintenance places.

Ans.3: -

Troubleshooting: It is the process of analyzing the behavior or operation of a faulty circuit to determine what is wrong with the circuit. It then involves identifying the defective component(s) and repairing the circuit. Depending on the type of equipment, troubleshooting can be a very challenging task. Sometimes problems are easily diagnosed and the problem component easily visible

Seven-step of Electrical Troubleshooting

1. **Gather the information.**
2. **Understand the malfunction.**
3. **Identify which parameters need to be evaluated.**
4. **Identify the source of the problem.**
5. **Correct/repair the component.**
6. **Verify the repair.**
7. **Perform root cause analysis.**

1.Gather information: Gathering information is a logical first step in any troubleshooting endeavour.

2.Understand the malfunction: Understanding the malfunction means that you understand how or what the process is and what portion of the process is operating incorrectly.

3. Identify which parameters need to be evaluated: Identifying which parameters need to be evaluated requires a clear understanding of the discrepancy and which signals affect the suspected component. Which input signals control the component? What is the expected

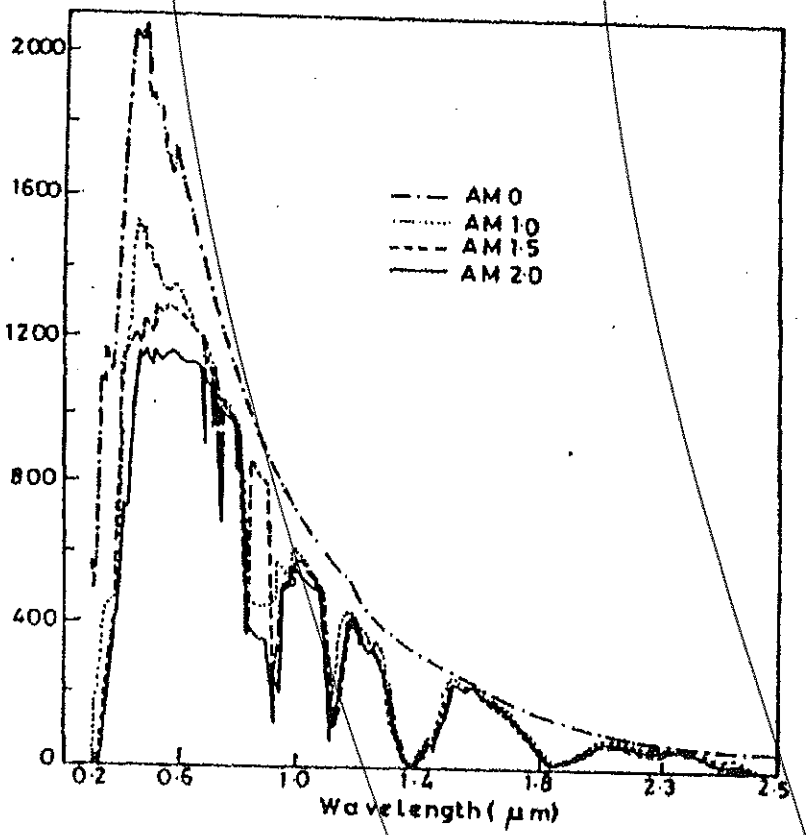


Fig.1.1 Spectral distribution of solar radiation

output from the suspect circuit? Is there a timing delay, sequence, or set point that can be verified?

4. Identify the source of the problem: Identifying the source of the problem requires the technician to isolate components and evaluate circuit parameters, to isolate the circuit by group when dealing with a complicated circuit (half-step approach), and to identify the malfunctioning component using the recorded data.

5. Correct/repair the component: Correct or repair the component identified as damaged based on the recorded data. Perform the required repairs to the circuit. Completing step 5 can range from simple adjustments to a complete component replacement.

6. Verify the repair: Verify the repair after completion. Ensure the equipment is operating as designed. Perform another round of testing to verify the equipment is in fact running correctly and that no other discrepancies exist.

7. Perform root cause analysis: Performing root cause analysis, even though mentioned last, began in the first step of the troubleshooting process. You should use the knowledge gained throughout the troubleshooting process in determining what could have possibly caused the component to fail.

Discovery of photovoltaic effect dates to 1839 when Edmond Becquerel, a French physicist [2], found photovoltage between two electrodes in an electrolyte solution. Photovoltaic effect in a solid substance was first reported by Adams and Day in 1877 [3] when they observed variations in electrical properties of selenium when exposed to light. Many solid state workers including Lange [4], Grondahl [5] and Schottky [6] did pioneering work on selenium and cuprous oxide photovoltaic cells. But till 1950s, selenium cells and copper/copper oxide cells were the prime photovoltaic converters. In 1954, Chapin, Fuller and Pearson [7] from Bell Telephone Laboratories, USA reported a single crystal silicon p-n junction solar cell with an efficiency of 6%. In the same year, Reynolds et al. [8] reported the first cuprous sulphide/cadmium sulphide heterojunction solar cell with about 6% efficiency. In 1956, Jenny et al. [9] reported the first GaAs solar cells with efficiency in excess of 6%. These are only a few mile stones to cite the early developmental history of photovoltaics.

1.2 Spectral distribution of solar radiation

The spectral distribution of solar radiation received by the earth is shown in Fig.1.1. It can be approximated to the spectrum of a black body at a temperature of 5973 K. Solar radiation gets attenuated as it passes through the atmosphere due to scattering by air molecules, dust particles and absorption by ozone, CO_2 and H_2O. The extent of attenuation of the direct solar radiation as it passes through the earth's atmosphere depends on the path length of the ray through the atmosphere and is generally expressed in terms of air mass. It is the ratio of the path length of direct solar radiation through the atmosphere at any time to the path length of the direct radiation when the Sun is at the zenith. Extra-terrestrial solar radiation, air-mass is taken as zero and is denoted as AM 0. When the Sun is at an angle of 90^0 from the horizon, the solar radiation

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: ELE 1105 **Time: 1 Hour**

Course Name: Electrical Safety **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

1. What is the full form of PPE?
   (a) Professional Protective Equipment (b) Personal Protective Equipment
   (c) Personal Protective Essentials (d) Personal Preventive Equipment
2. What is the full form of OSHA?
   (a) Occupational Safety and Health Administration
   (b) Occupational Safety and Hazard Administration
   (c) Operation Safety and Health Association
   (d) Operation Safety and Hazard Association
3. What is good tripping time of RCCB?
   (a) Less than 30 Sec (b) 10 Sec
   (c) Less than 30 m Sec (d) 1 Sec
4. In the following options, which one is not the type of Earthing.
   (a) Plate Earthing (b) Pipe Earthing (c) Pin Earthing (d) Rod Earthing
5. How many connection points does Earth Tester Have?
   (a) 1 (b) 2 (c) 3 (d) 4

Section – B

03X02 = 06 Marks

1. Write the names of the six different types of PPE.
2. List atleast four points about Electrical safety at the time of working with power tools.
3. Write the full form of RCCD and also explain its working.

Section – C

03X03 = 09 Marks

1. Describe the various properties and colour codes of a PPE, which we use to protect our head.
2. Write different points about how we achieved Electrically safe work condition at workplace.
3. What is the importance of Earthing in Electrical System?

A

Answer Key Set – A

Course Code: ELE 1105, Course Name: Electrical Safety

School of Electrical Skills, Session: 2020-21 (Summer Semester)

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Section-A

1. B
2. A
3. C
4. C
5. D

Section-B

Ans-1:

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

Ans-2:

- 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.

Ans-3:

Residual Current Circuit Breaker (RCCB). It 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.

Section-C

Ans-1:

Helmets and Head Covers.

Protective helmets must do three things:

- Resist penetration.
- Absorb the shock of a blow.
- Protect against electrical shock.

Helmet colour are decide according to work the different colour codes are

- White: Engineers, Supervisors, Mangers.
- Red: Fire Fighters
- Blue: Electrician, Carpenters, and other technical operators.
- Yellow: Labour, Earth mover operators.
- Brown: Welders, Workers with high heat and temperature appliances.
- Green: Safety Officers.
- Grey: Site visitors.

Answer Key Set – A

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Ans-2:

- Determine all possible sources of electrical supply to the specific equipment. Check applicable up to date drawings, diagrams and identification tags.
- After properly interrupting the load current, open the disconnecting device for each source.
- Where it is possible, visually verify that all blades of the disconnecting devices are fully open or that draw out type circuit breakers are withdrawn to the fully disconnected position.
- Apply lockout/tag out devices in accordance with a documented and established policy.
- Use adequately rated voltage detector to test each phase conductor or circuit part to verify they are de-energized. Before and after each test, determine the voltage detector is operating satisfactorily.
- Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being de-energized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

Ans-3:

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.