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**Test Project**

**State Skill Competitions**

**Skill-Electrical Installation**

**Version - 1**

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**Section - A**

# **A. Preface**

**Skill Explained:**

An electrician works on commercial, residential, agricultural, and industrial projects. There is a direct relationship between the nature and quality of the product required and the payment made by the customer. Therefore, the electrician has a continuing responsibility to work professionally in order to meet the requirements of the customer and thus maintain and grow the business. Electrical installation is closely associated with other parts of the construction industry and with the many products that support it, normally for commercial purposes.  The electrician works internally, including the homes of customers and on small and major projects. He or she will plan and design, select and install, commission, test, report, maintain, fault find, and repair systems to a high standard. Work organization and self-management, communication, and interpersonal skills, problem solving, flexibility and a deep body of knowledge are the universal attributes of the outstanding electrician.  Whether the electrician is working alone or in a team the individual takes on a high level of personal responsibility and autonomy. From working to provide a safe and reliable electrical installation and maintenance service, in accordance with relevant standards, through to diagnosing malfunctions, programming, and commissioning home and building automation systems, concentration, precision, accuracy, and attention to detail every step in the process matters and mistakes are largely irreversible, costly, and potentially life threatening.

**Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):**

Competitors born on or after 01 Jan 1998 are only eligible to attend the Competition.

**Total Duration: 4Hrs**

**Section - B**

# **B.Test Project**

**Competitor Instruction Sheet**

You have **4 hours** to complete this task.

Each competitor has to do following to complete the given task:

Install a distribution box with all required circuit breakers and other switches that can supply electrical power to sub-circuits with the following requirements:

1. Kitchen – one LED lamp 8 watts, one exhaust fan. One power point each for refrigerator, mixed grinder, microwave oven, and electric chimney.
2. Bathroom – two LED lamps (4 watts, 8 watts), two power points (geyser and hair dryer), one fresh air fan.
3. Bed room – two CFL lamps, two ceiling fans, one power point each for Lap top, mobile phone charger, electric mosquito repellant, and air conditioner 2 ton.

Ratings of distribution box elements are to be determined through legitimate calculations. The following tasks will be performed by the participants:

1. Determine the number of sub-circuits
2. Draw single line diagram of the arrangement
3. Determine ratings of the distribution box elements
4. Get the diagrams verified by the instructor
5. Prepare bill of quantities and get it verified
6. Procure the items as endorsed by the instructor
7. Install the distribution box and get it verified by the instructor
8. Test proper functioning of the distribution box by dummy loading

Note. The participants need to consider the following performance parameters throughout the activity as weightage is given for each of it:

1. Work organization and management
2. Communication and interpersonal skills
3. Problem solving, innovation, and creativity
4. Planning and design
5. Installation
6. Testing, reporting, and commissioning
7. Maintenance, fault finding, and repair

**Section –C**

# **C. Marking Scheme**

The Assessment is done by awarding points by adopting two methods, Measurement and Judgments

* Measurement - One which is measurable
* Judgments - Based on Industry expectations

Aspects are criteria’s which are judged for assessment.

In Electrical installation skill markings are done on both measurement and judgmental basis. For measurement marks awarded will be 0 or full marks and for judgmental marks will be awarded as

1. Below industry standard or no attempt:
2. Meets industry standard
3. Industry standard with elements of good practice
4. Excellent in comparison to industry standard

**Example**: If maximum marks for Judgment criteria is 1 and if all 3 Experts (Juries) give 3 points to a candidate, the candidate will get 1 mark for that aspect. If 2 Experts give 3 and 1 Expert gives 2 points, then candidate will get (3+3+2)/9\*1 = 0.89 marks for that aspect out of 1 mark.

|  |  |  |
| --- | --- | --- |
|  | **Criteria** | **Max. Marks** |
| A | Safety (Health & Safety Regulations) | 10 |
| C | Circuit design& Modification (Technical Specifications) | 10 |
| D | Making of Automation Control Panel/Center | 15 |
| E | Field Installation | 25 |
| F | Programming | 30 |
| G | Fault Finding | 10 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sub Criteria Name or Description** | **Aspect Type M = Meas J = Judg** | **Aspect - Description** | **Judge Score** | **Max Mark** | **Marks Obtained** |
| **A1- Health & Safety** |  |  |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 0.50 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 0.50 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
| **A2- Health & Safety** |  |  |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 1.00 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 1.00 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
| **A3- Health & Safety** |  |  |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 1.50 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 1.50 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
| **A4- Health & Safety** |  |  |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 2.00 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
|  | M | No breaches and maintained a tidy workspace = 0.5 marks |  | 2.00 |  |
|  |  | Any breach must be confirmed by at least 2 Experts and recorded in a skill log book |  |  |  |
|  |  |  |  |  |  |
| **B1-Commissioning process** |  |  |  |  |  |
|  | M | Installation fully complete (all equipment and covers in place) when electrical supply is requested - confirmed by at least 2 Experts with a visual check |  | 3.00 |  |
|  | M | Installation electrically safe (all equipment fixed in place and all cables connected) when electrical supply is requested - confirmed by at least 2 Experts with a visual check |  | 3.00 |  |
|  | M | Safe work practices during power-up (all circuits powered). If any unsafe practices observed and confirmed by at least 2 experts = 0 marks |  | 4.00 |  |
|  | M | Safe work practices during commissioning. If any unsafe practices observed and confirmed by at least 2 experts = 0 marks |  | 4.00 |  |
|  | M | Safe work practices during testing. If any unsafe practices observed and confirmed by at least 2 experts = 0 marks |  | 4.00 |  |
|  | M | No short circuits or earth faults during power-up and commissioning. If any short circuit or earth fault observed and confirmed by 2 experts = 0 marks |  | 3.00 |  |
|  | M | All equipment labelled correctly following commissioning. |  | 2.00 |  |
|  | M | Function chart completed by competitor reflecting actual function |  | 2.00 |  |
|  |  |  |  |  |  |
| **C1-Circuit design** |  |  |  |  |  |
|  | M | Size - supply cabling Switch 1 |  | 1.50 |  |
|  | M | Colour code as per instructions |  | 1.50 |  |
|  | M | Size - supply cabling Switch 2 |  | 1.50 |  |
|  | M | Colour code as per instructions |  | 1.50 |  |
|  | M | Size - supply cabling MCB |  | 1.50 |  |
|  | M | Colour code as per instructions |  | 1.50 |  |
|  | M | Size - supply cabling Socket |  | 2.00 |  |
|  | M | Size - cabling for lights |  | 2.00 |  |
|  | M | Size - cabling for power outlets |  | 2.00 |  |
|  |  |  |  |  |  |
| **D1-Measurements** |  |  |  |  |  |
|  | M | Measurement 1 (Centres of socket to MCB) |  | 2.00 |  |
|  | M | Measurement 2 (Centres of MCB to Switch2) |  | 2.00 |  |
|  | M | Measurement 3 (Centres of Switch2 to Lamp1 ) |  | 2.00 |  |
|  | M | Measurement 4 (Center of Lamp1 to Switch2) |  | 2.00 |  |
|  | M | Measurement 5 (Center of Socket to Switch 1) |  | 2.00 |  |
| **E1-Installation of Equipment** |  |  |  |  |  |
|  | M | Correct equipment in correct locations on back wall of cubicle as per drawing |  | 1.25 |  |
|  | M | Correct equipment in correct locations on left hand wall of cubicle as per drawing |  | 1.25 |  |
|  | M | Socket securely installed |  | 1.25 |  |
|  | M | Switch 1 securely installed |  | 1.25 |  |
|  | M | Switch 2 securely installed |  | 1.00 |  |
|  | M | Lamp 1 securely installed |  | 1.00 |  |
| **E2-Installation of Wire ways (Trunking and tray)** |  |  |  |  |  |
|  | J | PVC Trunking. Securely fitted. Joints and angles are neat with no gaps. Secure with no roll. |  | 2.00 |  |
|  |  | Below industry standard or no attempt: Joints are badly cut with excessive gaps. Lids not fitted or not fitted correctly. Roll or movement of trunking. | 0 |  |  |
|  |  | Meets industry standard: Joints are neat and even but with gaps. Covers fitted. No roll or movement. | 1 |  |  |
|  |  | Industry standard with elements of good practice: Joints are neat with only some minor gaps. Covers fitted. No roll or movement. | 2 |  |  |
|  |  | Excellent in comparison to industry standard: Joints are neat with no gaps. Covers fitted. No roll or movement. | 3 |  |  |
|  | J | Cable tray. Securely fitted. Joints and angles are neat with no gaps. Secure with no roll or movement. |  | 2.00 |  |
|  |  | Below industry standard or no attempt: Joints are badly cut with excessive gaps Cuttings have sharp edges and/or burrs. Roll or movement of tray or brackets. | 0 |  |  |
|  |  | Meets industry standard: Joints are neat and even but with gaps. Some cuttings have sharp edges and/or burrs. No roll or movement of tray or brackets | 1 |  |  |
|  |  | Industry standard with elements of good practice: Joints are neat with only some gaps. Cuttings have no sharp edges but some burrs. No roll or movement of tray or brackets | 2 |  |  |
|  |  | Excellent in comparison to industry standard: Joints are neat with no gaps. Cuttings have no sharp edges or burrs. No roll or movement of tray or brackets | 3 |  |  |
| **E3-Installation of wire ways (Cable and conduits)** |  |  |  |  |  |
|  | J | Cable. Correctly clipped with straight runs and even bends. |  | 2.00 |  |
|  |  | Below industry standard or no attempt: Clips unevenly spaced. Cable not straight and even. Bends too sharp or too long. | 0 |  |  |
|  |  | Meets industry standard. Cable straight and even with good bends but clips not evenly spaced. | 1 |  |  |
|  |  | Industry standard with elements of good practice: Cable straight and even with good bending and the majority of cable clips evenly spaced. | 2 |  |  |
|  |  | Excellent in comparison to industry standard: Cable straight and even with good bending and all cable clips evenly spaced. | 3 |  |  |
|  | J | PVC and metal conduit. Bends, angles and jumps are even with no distortions |  | 2.00 |  |
|  |  | Below industry standard or no attempt: Saddles not evenly spaced, poor termination to trunking or boxes, poor bends with uneven radius and distortions. Jump overs not matching | 0 |  |  |
|  |  | Meets industry standard: Majority of bends have even radius with some minor distortion. Saddles evenly spaced and correct terminations to trunking and boxes. Jump overs not matching. | 1 |  |  |
|  |  | Industry standard with elements of good practice: All of the bends have even radius with no distortion. Saddles evenly spaced and correct terminations to trunking and boxes. Jump overs closely matching. | 2 |  |  |
|  |  | Excellent in comparison to industry standard: All of the bends are smooth, have identical bend radius and are at the correct angles. Jump overs are matching. | 3 |  |  |
| **F1-Wiring in boards** |  |  |  |  |  |
|  | J | Neatness of wiring in Switch1 |  | 2.00 |  |
|  |  | Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear. | 0 |  |  |
|  |  | Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear. | 1 |  |  |
|  |  | Industry standard with elements of good practice: All looms neatly with very few cabling crossovers. Majority of cabling straight and vertical into switchgear. | 2 |  |  |
|  |  | Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling straight and vertical into switchgear. | 3 |  |  |
|  | J | Neatness of wiring in Switch2 |  | 2.00 |  |
|  |  | Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear. | 0 |  |  |
|  |  | Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear. | 1 |  |  |
|  |  | Industry standard with elements of good practice: All looms neatly with very few cabling crossovers. Majority of cabling straight and vertical into switchgear. | 2 |  |  |
|  |  | Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling straight and vertical into switchgear. | 3 |  |  |
|  | J | Neatness of wiring in Lamp1 |  | 2.00 |  |
|  |  | Below industry standard or no attempt: All cables not loomed or loomed but untidy. Cabling not straight and vertical into switchgear. | 0 |  |  |
|  |  | Meets industry standard: All looms are neat and tidy but with some cabling crossover. Some cabling straight and vertical into switchgear. | 1 |  |  |
|  |  | Industry standard with elements of good practice: All looms neat with very few cabling crossovers. Majority of cabling straight and vertical into switchgear. | 2 |  |  |
|  |  | Excellent in comparison to industry standards: All looms with no cabling crossovers. All cabling straight and vertical into switchgear. | 3 |  |  |
| **F2-Cabling on tray** |  |  |  |  |  |
|  | J | Neatness of cables on cable tray |  | 1.50 |  |
|  |  | Below industry standard or no attempt: All cables not cable tied or cable tied but untidy. Cables not secured properly to tray. Bends on cables are uneven. No segregation of cabling | 0 |  |  |
|  |  | Meets industry standard: Cables neat and tidy but cable ties are unevenly spaced. No kinks or twists on cables. Most of the bends on cables are even. Cables segregated correctly. | 1 |  |  |
|  |  | Industry standard with elements of good practice: Cables neat and tidy and cable ties are evenly spaced. No kinks or twists on cables. Most of the bends on cables are even. Cables segregated correctly. | 2 |  |  |
|  |  | Excellent in comparison to industry standards: Cables well grouped and stacked, very neat and tidy and cable ties are evenly spaced. No kinks or twists on cables. All of the bends on cables are even. Cables segregated correctly. | 3 |  |  |
| **F3-Terminations** |  |  |  |  |  |
|  | M | Switch1: All conductors securely terminated with no bare copper showing |  | 1.50 |  |
|  | M | Switch2: All conductors securely terminated with no bare copper showing |  | 1.50 |  |
|  | M | MCB: All conductors securely terminated with no bare copper showing |  | 1.50 |  |
|  | M | Lamp1: All conductors securely terminated with no bare copper showing |  | 1.50 |  |
|  | M | Socket: All conductors securely terminated with no bare copper showing |  | 1.50 |  |
|  |  |  |  |  |  |
| **G1-Installation Testing** |  |  |  |  |  |
|  | M | Insulation resistance test - instrument and procedure |  | 2.00 |  |
|  | M | Insulation resistance test - value and unit report sheet |  | 2.00 |  |
|  | M | Earth Continuity test - instrument and procedure |  | 2.00 |  |
|  | M | Earth Continuity test - value and unit report sheet |  | 2.00 |  |
|  | M | Overall operation testing of circuit |  | 2.00 |  |
|  |  | **Total** |  | **100.00** |  |

**Section - D**

# **D. Infrastructure List**

Infrastructure List (Tool and equipment including raw material)

The quantity is given for each candidate

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Item** | **Requirement/specification** |
| 1 | Multi Screw Drive | 1 Set |
| 2 | Plier Insulated | 1 Per Competitor |
| 3 | Measuring tape | 1 Per Competitor |
| 4 | Spirit Lever | 1 Per Competitor |
| 5 | Chauck | 1 Per Competitor |
| 6 | Light Hammer | 1 Per Competitor |
| 7 | Multimeter  (Digital 3 ½ digit) | 1 Per Competitor |
| 8 | Line Tester | 1 Per Competitor |

**Section –E**

# **E. Instructions for candidates**

The Health, Safety, and Environment Policy and Regulations are given below for the skill competition on electrical installation.

During the Competition Competitors

* MUST wear ear protection and eye protection at all times.
* All marking points regarding health and safety marks will be made clear to all Competitors before competition begins.

If the supervising Experts, who are watching the Competitors, witness any breach of the Health, Safety and Environment requirements during the Competition they will:

* + On the first occasion: Warn the Competitor and make a note of the breach;
  + On the second occasion: Warn the Competitor and make a note of the breach;
  + On the third occasion: A record of the breach will be made and result in a loss of the Health and Safety marks.

**Section –F**

# **F. Health, Safety, and Environment**

1. All accredited participants, and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.
2. All participants, technicians and supporting staff will wear the required protective Personnel clothing.
3. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage, however in case of Injury the competitor will immediately inform the immediate organizer for medical attention.