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India skills

Sample Test Project

District / Zonal Skill Competitions

Skill- Information Network Cabling

Category: Information and Communication Technology

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Section - A : Preface

Skill Explained:

Cable is the medium through which information moves from one network device to another. There are several types of cable which are commonly used in network infrastructures. In some cases, a network will utilise only one type of cable, while other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

The Network Cabling skills is an amalgamation of skills/competencies required towards setup of infrastructure for all telecommunication networks such Wide Area Networks (WAN), Local Area Networks (LAN) and Enterprise networks including Data centers. This work is highly technical and requires detailed specialised knowledge, which conforms to recognised industry standards.

The installer may work for either a telecommunication or a communications network company. He or she will install network cabling for businesses both large and small or for domestic users, for services such as cable TV, telephone and broadband installations. Setup of robust and reliable communications networks are critical to business success and the installer plays a major role in ensuring the work is as per the specified standards.

Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):

Competitors born on or after **01 Jan 1994** are only eligible to attend the Competition.

Total Duration: 5 Hrs

Section – B : Test Project

TOTAL DURATION OF TEST : 05 hours only

The test comprises of three (03) modules. Module 1 is focused on Optical Fiber cabling layout & terminations as per the provided technical drawing. Module 2 focuses on UTP Layout and UTP & Fiber terminations whereas Module 3 is designed on troubleshooting for both the copper and fiber cabling systems.

MODULE 1 : OPTICAL FIBER CABLING {Duration – 02 Hrs, Total Marks – 40}

(a) INTRODUCTION

The Optical Fiber Cabling System the core to deployment of high speed, high bandwidth solutions and requires high skill sets for deployment to meet standards & specifications. Various components are deployed as part of the OF cabling system (Fiber Optic Enclosures, LIU's, Patch Panels, Patch Cords, Terminal Outlets etc)

(b) DESCRIPTION OF PROJECT AND TASKS

Module 1 is designed to assess the basic skillsets required for minimal setup of Optical Fiber cabling infrastructure. The FO cable is to be deployed from a Fiber Optic Enclosure (FOE) (one end connected to Equipment Rack) another FOE, the output of which connects to a Terminal Outlet (TO). Pigtails and splicing will be required at each FOE. Patch-Cords will be connecting the FOE to the Equipment Rack and TOs. In between the FOEs, the FO cable will be required to be pulled through a pre-installed conduit.

The entire work is to be undertaken in compliance to the “Technical Drawing” - ISC_2018_TD#1_Module#1, placed at “Appendix ‘A’” to this document.

(c) DELIVERABLES

The competitor is expected to complete the following, as per the Technical drawing :-

- (i) Laying of 12 core fiber between Fiber Optic Enclosure's (between FOE-1 & FOE-2)
- (ii) Termination of 02 fiber cores at each FOE (full procedure : Cable Stripping, Cleaving, Cleaning, Splicing)
- (iii) Undertake 04 Fusion Splicing (using 04 Pug Tails – 02 at each FOE)
- (iv) 01 Patch cord loopback as per the technical drawing
- (v) Connectivity check using VFL (Visual Fault Locator)

MODULE 2 : UTP Installation & Fiber & UTP Termination {Duration – 02 Hrs Total Marks – 40}

(a) INTRODUCTION

The U/UTP cables form the last mile run (to the consumer premise) in majority of the deployments. Structured laying of U/UTP cables from the equipment rack (generally installed

as a common node with FO backbone and multiple UTP cables running to consumers) to the consumer Telecommunication Outlet is essential for quality of connection. With FTTX deployments on the increase, FO termination at the customer premise is also part of the scope.

(b) DESCRIPTION OF PROJECT AND TASKS

Module 2 is designed to assess the basic skillsets required for minimal setup of U/UTP cables and terminations of both the UTP and Fiber at the Customer premise telecommunication outlets. The entire work is to be undertaken in compliance to the “Technical Drawing” - ISC_2018_TD#1_Module#1, placed at “Appendix ‘A’” and ISC_2018_TD#2_Module#2, placed at “Appendix ‘B’”.

(c) DELIVERABLES

The competitor is expected to complete the following, as per the Technical drawing :-

- (i) Laying of U/UTP CAT 5e between Rack-1 and Telecommunication Outlet (TO) as per the Technical Drawing (ISC_2018_TD#2_Module#2)
- (ii) Termination of UTP at both ends (Rack and TO)
- (iii) Termination of FO at Fiber Optic Telecommunication Outlet as per Technical drawing ISC_2018_TD#1_Module#1
- (iv) Test connectivity using VFL and UTP/LAN tester

MODULE 3 : Troubleshooting {Duration – 01 Hrs, Marks – 20}

(a) INTRODUCTION

In order to operate the Cabling system stably, skills for operation and maintenance are essential. It is a skill to find trouble lurking in the system, using professional measuring instruments etc., to find out the cause and rectify it.

(b) DESCRIPTION OF PROJECT AND TASKS

In this module, Competitor finds cabling faults using a LAN tester for a U/UTP link and using a VFL for a optical link of the Cabling system installed. The competitor is to explain the fault and suggest remedial action.

(c) DELIVERABLES

The competitor is expected to complete the following :-

- (i) Identify the faults in the fiber/UTP cables (faults will be injected by the Expert at site)
- (ii) Suggest remedial action

Section – C : Marking Scheme

(a) **Marking Scheme for Module – 1.** The total mark of Module 1 is “40”. The assessment criteria of Module1 includes the following:

(i) Planning and design

- Demonstrate understanding of the Technical drawing.- 02
- Work planning & Scheduling - 02
- Select of correct material (FO cable, Pigtails, Patch cords etc) the tools

(ii) Installation - 03

- Demonstrate understanding & apply manufacturers’ instructions on handling of FO cables and cords - 02.
- Install and optical fibre cabling system as shown in Technical drawing - 05
- Connect and splice & terminate optical fibre cables and patch cords as per the technical drawing - 07
- Demonstrate proper storage and securing of fiber pigtails within the FOEs and coiling of extra fiber length (3 Mtrs at each FOE) - 04
- Organize & label cabling for future reconfiguring, as per the standards - 02

(ii) Work organization and management

- Use personal protective equipment correctly - 03
- Demonstrate correct selection, use, cleaning, maintenance, and storage of tools and equipment safely and securely - 02
- Maintain workplace tidy and clean during and post work completion - 02

(iii) Measurement/Testing & Recording

- Check FO cable continuity and polarity using Visual Fault Locator (VFL) - 04
- Record results - 02

(b) **Marking Scheme for Module – 2.** The total mark of Module 2 is “40”. The assessment criteria of Module1 includes the following:

(i) Planning, Design & Work Organisation

- Appropriate work planning as per the given technical specifications - 02
- Select the appropriate cabling media and tools - 02
- Correct wearing and use of personal safety gear - 03
- Selecting proper cable pulling/cable lying tools/equipment - 03

(ii) Installation

- Applying proper cable installation procedure - 02
- Correct handling of cables for bend-radius compliance - 02
- Install and U/UTP cabling system as shown in Technical drawing - 03
- Connect & terminate U/UTP cables at the Equipment Rack Management Panel and at Telecommunication Outlet (TO) (as per the drawing) - 04

- Terminate FO cable from the patch panel to the FO outlet using Mechanical Splice Connectors - 04
- Demonstrate cable management techniques for securing U/UTP cables - 03
- Organize and label cabling to make future reconfiguring, as per the standards - 02
- Appropriate cleaning of workspace after completing - 02

(iii) Measurement/Testing & Recording

- Use of Visual Fault Locator - 02
- Use of UTP Tester - 04
- Recording of results - 02

(c) **Marking Scheme for Module – 3.** The total mark of Module 3 is “20”. The assessment criteria of Module1 includes the following:

(i) Proper Procedure & Safety Practices

- Logical approach to problem solving – 03
- Adoption of all safety practices – 02
- Correct selection and checks of all tools & equipment - 02

(ii) Fault Identification

- Fault identification using the testing tools/equipment - 05
- Applying reasoning to the cause - 04
- Suggesting remedial actions - 04

Section – D : Equipment List

Equipment, Machinery, Installation & Materials Required

Item	Quantity	Materials	Description
Splicer	1	Fusion Splicer	
VFL	1	Visual Fault Locator	
FOE	2	Fiber Optic Enclosure	Wall Mount
Fiber Patch Panel	2	Fiber patch panel (snap-in slots)	Patch panel is to be fitted on the FOE (on one side face)
Pigtails	6	Fiber pigtails	Pig tails with compatible the Fiber cable (SC Connectors for SM Fiber)
Fiber Optic Cable	1	Fiber Optic Cable (SM) – 12 Core {Distribution Cable – Indoor Type}	25 Mtr FO cable (Single Mode) – 24 Core {Distribution cable – Indoor Type}
	2	Fiber Pulling Grips	Fiber Pulling Grips for pulling the indoor fiber over cable trays or through conduits
	1	Standard Tool Kit	Cleavers, Strippers, Cleaner, Splice protection sleeve,
	2 Sets	Personal Safety Gear	Safety Glasses with Side Shields, Safety hand Gloves
Mechanical Splice Connectors	4	Mechanical splice connectors	For Telecommunication Outlets (TO's)
Splicer	1	Mechanical Splicing tools, consumables	
TO(Fiber)	2	Fiber Optic Termination Outlet	Fiber Optic Termination Outlet (at customer premise) with FO termination cord and connector (pre-spliced)
TO (UTP)	2	UTP Terminal Outlet	UTP Terminal Outlet (at customer premise)
UTP Cable	50 Mtr	UTP Cable CAT5e	
FO Cable	25 Mtr	Flexible FO Cable (4 core)	Flexible FO cable for installation inside customer premise

UTP Cable Tester	1 Set	UPT Cable Tester	UTP/LAN Tester
UTP Patch Cord	4	UPT Patch cords	UTP path cords (Factory Crimped)
Fiber Optic Cable	25 Mtr	12 Core	SM Fiber Optic Cable for simulating fault
U/UTP Cable	25 Mtr	-----	U/UTP cable CAT 5e for simulating fault
Patch Cords	4	-----	Multi Mode Patch Cords for fault simulation (SC Connectors as deployed in Module # 1)

Section – E : Instructions to Candidates

INSTRUCTIONS TO CANDIDADETS

General Rules

- Competitor should carry the id proof and birth date proof should reach venue 15 minute before the entry time.
- No Group work is permitted, it's individual competition.
- Module briefing will be for 15 minutes & will be done before the start of competition
- Open communication / Q&A will be conducted after module briefings.
- Module related queries will not be entertained after the start of competition.

Rules of competition

- Competitor will be disqualifying for any misbehaviour.
- All the rights of the competition are revered with State Skill Competition Committee/SSC/Conducting body
- When you have finished the current module, you can proceed to the requirements for the next module.

Task Rules/Guidelines

The work is to be carried out in accordance with the “technical drawing” provided at appendix “A” & “B” for Module 1 & 2 respectively.

Follow the following guidelines/instructions :-

- (i) Read and understand the Technical drawing.
- (ii) Plan the work as per the technical drawing and specifications therein.
- (iii) Schedule work required to achieve a given outcome and within the specified time
- (iv) Read, understand, and apply manufacturers’ instructions on handling of FO cables and cords.
- (v) Select the optimal cable installation process in the given environment.
- (vi) Fiber colour code as per the standards (participants will be informed/code will be displayed)
- (vii) Prioritize work and comply with plans to minimize disruption and to meet agreed time lines
- (viii) Use personal protective equipment correctly.
- (ix) Maintain neat and tidy work environment

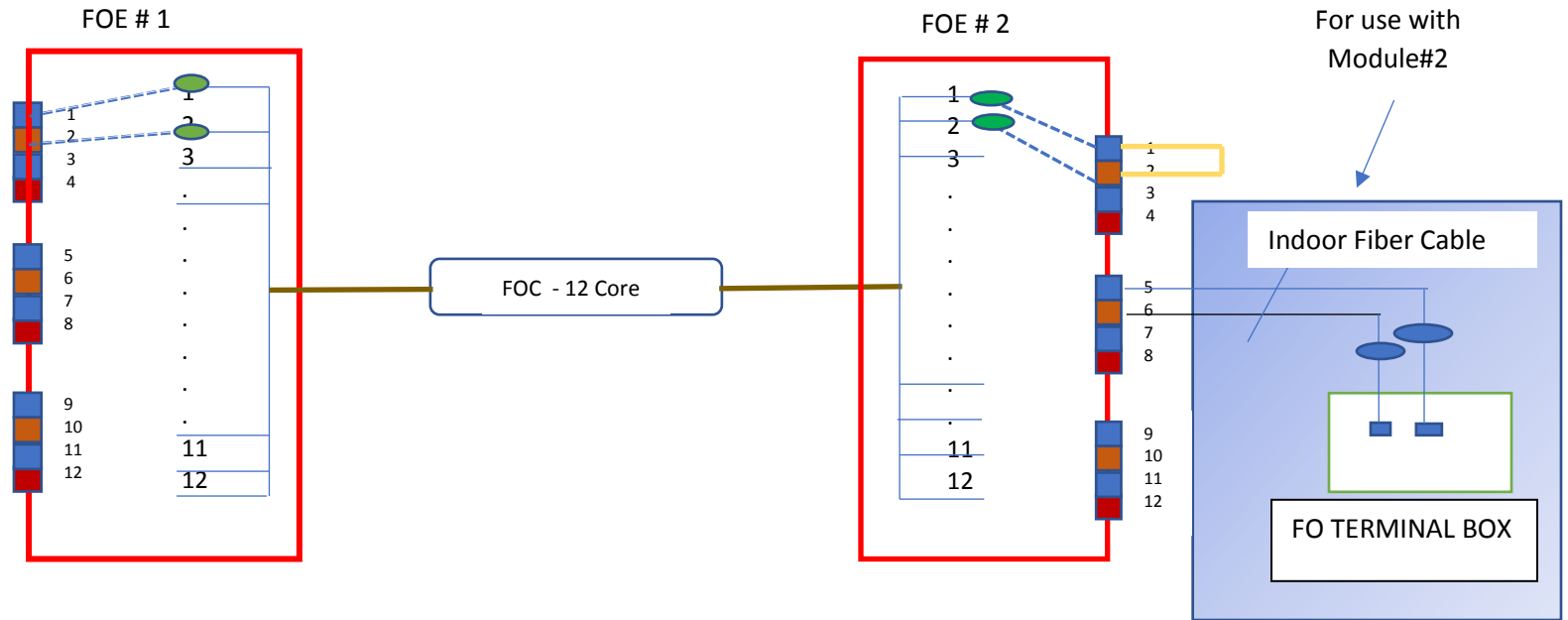
Section – F : Health, Safety and Environment

Candidates are to adhere to following guidelines

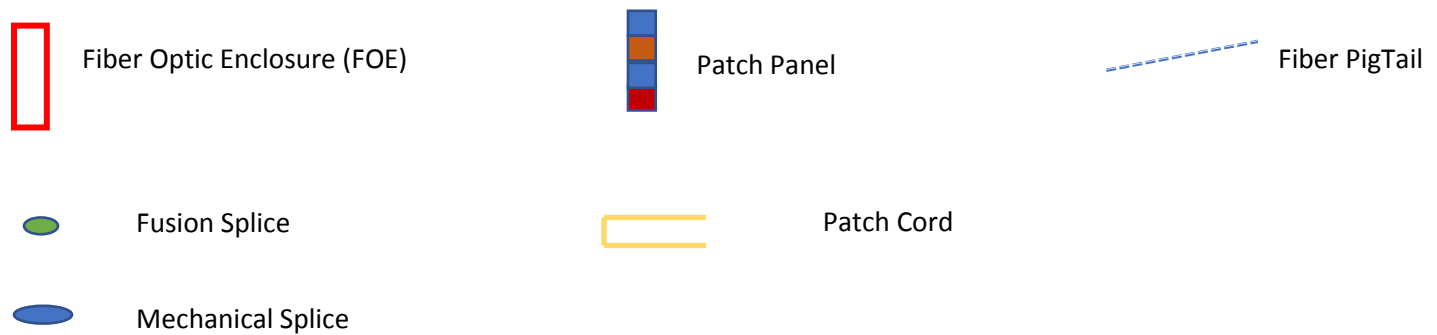
1. Follow all safety norms as covered during the briefing prior to the start of the competition
2. Always wear safety glasses always during fiber installation
3. Always ensure correct disposal of fiber waste
4. All Competitors should observe safety with respect to the use of tools, equipment and material and should properly and correctly use them to prevent any mishap.
5. In case of an accident, Competitor will have to stop and cancel the competition.
6. Identify the problems that may exist and check with experts
7. Check the material list/tools and inform expert for missing items
8. When doing measurement, Competitors need to call Expert(s)
9. When in doubt on any safety issue/matter, call for the attention of the expert

ISC 2018 TD#1 Module#1

Appendix "A"



Task – 04 Fusion Splices, 04 Pig Tail connections (with fusion splices), 01 patch cord connection, laying of 12 core fiber between FOE#1 and FOE#2



[CO-2] *2
U/UTP Cat.5e

RACK # 1

ISC 2018 TD#2 Module#2 ("App B")

1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24

2B

C
a
b
l
e

R
a
c
k

[CO-2] *2
U/UTP Cat.5e

UTP TO

1	TO-1	1
2	(1)	2

Legend

← Termination by Modular Jack

Back Side (Termination Portion)

1	TO-1	1
2	(1)	2

 Front Side (Socket Portion)

Position No. of Face Plate

1	2
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TO(x)