Qualification Pack

SATCOM Operation Technician

QP Code: TEL/Q6222

Version: 1.0

NSQF Level: 5

Telecom || 3rd Floor, Plot No 126, Sector - 44
Gurgaon - 122003 || email:QAteam@tsscindia.com

Contents

Qualification Pack

TEL/Q6222: SATCOM Operation Technician

Brief Job Description

SATCOM Operation Technician is responsible for installing antennas at remote ends, establishing links, and operating ground stations. They conduct signal analysis, maintain ground stations, and implement security measures. Additionally, they manage Network Operation Centre (NOC) or Hub, handle incident management or PM activities, and oversee network management, performance optimization, and testing for seamless SATCOM operations.

Personal Attributes

This job requires the individual to have good knowledge of wireless communication with basic knowledge of satellite communication, frequency band and some basic communication Technique.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. TEL/N6267: Install of Antenna at remote end and establish link
2. TEL/N6268: Set up and Operate Ground Station
3. TEL/N6269: Signal Analysis, Ground Station Maintenance, and Security Implementation
4. TEL/N6270: Manage Network Operation Centre (NOC) or Hub
5. TEL/N6271: Incident management or PM Activity
6. TEL/N6272: Network Management, Performance Optimization and Testing
7. TEL/N9104: Manage Work, Resources and Safety at workplace
8. DGT/VSQ/N0102: Employability Skills (60 Hours)

Qualification Pack (QP) Parameters

Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
Country	India

Qualification Pack

NSQF Level	5
Credits	19
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3114.0701
Minimum Educational Qualification & Experience	Completed 2nd year of UG (UG Diploma) (of 3-years/4-years UG BE, B. Tech (Electrical/ Electronics & Instrumentation/ Mechanical, Civil Engineering)) OR Completed 2nd year diploma after 12th (in relevant field with 1 year of relevant experience) OR Completed 3 year diploma after 10th (in relevant field with 1 year of relevant experience) OR Previous relevant Qualification of NSQF Level (4 (Infrastructure Technician-5G Network, Technician 5G- Active Network Installation)) with 3 Years of experience
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	31/01/2027
NSQC Approval Date	31/01/2024
Version	1.0
Reference code on NQR	QG-05-TL-01993-2024-V1-TSSC
NQR Version	1

TEL/N6267: Install of Antenna at remote end and establish link

Description

This OS unit is about installation of antenna at remote end to provide end to end connectivity

Scope

The scope covers the following :

- Tools and Equipment Preparation
- Antenna Assembly
- Software Installation and Configuration
- Network Configuration and Connectivity
- System Libraries and Files

Elements and Performance Criteria

Tools and Equipment Preparation

To be competent, the user/individual on the job must be able to:

PC1. identify the telenet tools and IPv4 setting in laptop

PC2. assemble the antenna as per provided guidelines using prescribed tools

PC3. review the necessary guidelines, including the antenna assembly instructions, safety precautions, and any specific requirements

PC4. collect the necessary tools like wrenches, screwdrivers, cable cutters, crimping tools, torque wrenches, alignment tools, and any specialized tools mentioned in the instructions

Antenna Assembly

To be competent, the user/individual on the job must be able to:

PC5. test and commission the antenna

PC6. set up a clean and organized work area with enough space to assemble the antenna

PC7. identify and familiarize with the various components of the antenna system, such as the reflector, feed assembly, mounting brackets, cables, and connectors

PC8. follow the guidelines to mount the antenna on the designated structure or mount

PC9. prescribe tools to secure the antenna assembly properly

PC10. attach the cables to the appropriate connectors on the feed assembly and ensure they are securely fastened

PC11. use cable cutters, crimping tools, or other specified tools for cable termination or connector installation

PC12. use a torque wrench to tighten bolts and nuts to the recommended torque values

PC13. ensure proper grounding of the antenna system to minimize the risk of electrical hazards and protect against lightning strikes

PC14. double-check all connections, ensuring they are correctly installed and tightened

PC15. inspect the entire antenna assembly for any visible damage, loose components, or irregularities

Software Installation and Configuration

To be competent, the user/individual on the job must be able to:

PC16. install and configure software according to IDU (Indoor Unit-Modem)

PC17. ensure that the computer or server where the software will be installed meets the minimum requirements specified by the manufacturer like hardware specifications, operating system compatibility, and available storage space

PC18. physically connect the IDU modem to the computer or server using the appropriate interface, such as Ethernet, USB, or serial connection

PC19. access the management software or configuration interface provided by the manufacturer to configure network settings for the IDU modem which include IP address, subnet mask, default gateway, and any other network parameters required for communication with other devices or networks

PC20. check for any available firmware or software updates for the IDU modem

PC21. verify the connectivity between the IDU modem and the satellite network or other associated devices

PC22. perform tests to ensure proper signal acquisition, data transmission, and system functionality

PC23. maintain a record of the software installation and configuration details, including any changes made to default settings

PC24. regularly monitor the performance and health of the IDU modem software

Network Configuration and Connectivity

To be competent, the user/individual on the job must be able to:

PC25. access modem with master IP in web browser

PC26. master IP address is a unique address assigned to the modem or gateway device in the SATCOM network

PC27. obtain the master IP address from the network administrator or refer to the modem's documentation

PC28. connect computer with network IP modem

PC29. connect computer to the network using an Ethernet cable or via a Wi-Fi connection

PC30. open a Web Browser and use Google Chrome, Mozilla Firefox, Microsoft Edge, or Safari

PC31. exact options and menus available will depend on the specific modem model and manufacturer

PC32. set the master IP to 192.168.0.1

PC33. connect to the device or system that manages the SATCOM operations, typically a network router, switch, or satellite modem

PC34. enter the appropriate username and password to log in to the configuration interface

PC35. look for the IP address configuration settings. This can typically be found under a section called "LAN Settings," "Network Setup," or similar.

PC36. along with the IP address, and need to specify the subnet mask and default gateway

PC37. apply IP assignment on laptop or computer

System Libraries and Files

To be competent, the user/individual on the job must be able to:

PC38. identify and understand features of system libraries and files related to be installed

PC39. consult system manuals, documentation, and vendor-provided information to understand the required libraries and files for installation and operation

PC40. review the system requirements provided by the SATCOM system vendor or manufacturer

PC41. examine the SATCOM system's architecture and components to identify any specific libraries and files associated with each component

PC42. review the release notes and change logs provided by the SATCOM system vendor

PC43. look for system libraries, configuration files, and any additional files that are essential for SATCOM operations

PC44. conduct thorough testing to ensure that all required system libraries and files are present and functioning correctly

PC45. regularly check for new versions of libraries and files associated with the system to ensure that you are using the latest and most stable versions

PC46. use mutimeter for voltage measurement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. antenna size and type

KU2. basic knowledge of satellite direction

KU3. requirements of the work area and weather it is free from clutter and provides adequate lighting

KU4. follow the instructions for cable routing and make sure to avoid any sharp bends or excessive tension on the cables

KU5. follow the prescribed grounding procedures and connect the necessary grounding wires or conductors

KU6. prescribed tools or testing equipment to carry out RF tests accurately

KU7. safety features like protective covers or shields are in place as specified

KU8. follow the manufacturer's instructions to install the software on the computer or server

KU9. firmware updates often bring bug fixes, performance improvements, and new features

KU10. configuration files or settings to facilitate easy recovery in case of system failures or the need for reinstallation

KU11. manufacturer's documentation and support channels to address any issues, apply patches, or troubleshoot problems that may arise

KU12. the subnet mask for a typical local network is often "255.255.255.0.", the default gateway is usually the IP address of the router or main network device

KU13. the necessary software components, libraries, and files needed for proper operation

KU14. basic knowledge of RF parameter

KU15. basic knowledge of RG cables

KU16. operation of LNB (receiver) and transmitter (BUC)

KU17. satellite parameters should be correct

KU18. basic knowledge of frequency band (KU, KA and C-band)

KU19. communication technique

KU20. half and full duplex concept
KU21. internet concept of operation

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. understanding of project need
GS2. communicate with client for specific need
GS3. listen and coordination with others
GS4. probe customers using appropriate open and close ended questions to understand the nature of problem, without any pre-conclusions
GS5. plan the development activities
GS6. organize all hardware/software components required for setup
GS7. manage time and work
GS8. read and comprehend/understand equipment installation manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Tools and Equipment Preparation	**4**	**4**	**-**	**-**
PC1. identify the telenet tools and IPv4 setting in laptop	1	1	-	-
PC2. assemble the antenna as per provided guidelines using prescribed tools	1	1	-	-
PC3. review the necessary guidelines, including the antenna assembly instructions, safety precautions, and any specific requirements	1	1	-	-
PC4. collect the necessary tools like wrenches, screwdrivers, cable cutters, crimping tools, torque wrenches, alignment tools, and any specialized tools mentioned in the instructions	1	1	-	-
Antenna Assembly	**9**	**16**	**-**	**3**
PC5. test and commission the antenna	-	1	-	1
PC6. set up a clean and organized work area with enough space to assemble the antenna	1	1	-	-
PC7. identify and familiarize with the various components of the antenna system, such as the reflector, feed assembly, mounting brackets, cables, and connectors	-	2	-	-
PC8. follow the guidelines to mount the antenna on the designated structure or mount	1	1	-	-
PC9. prescribe tools to secure the antenna assembly properly	2	1	-	1
PC10. attach the cables to the appropriate connectors on the feed assembly and ensure they are securely fastened	1	2	-	-
PC11. use cable cutters, crimping tools, or other specified tools for cable termination or connector installation	1	1	-	-
PC12. use a torque wrench to tighten bolts and nuts to the recommended torque values	1	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. ensure proper grounding of the antenna system to minimize the risk of electrical hazards and protect against lightning strikes	1	2	-	-
PC14. double-check all connections, ensuring they are correctly installed and tightened	-	2	-	1
PC15. inspect the entire antenna assembly for any visible damage, loose components, or irregularities	1	2	-	-
Software Installation and Configuration	**5**	**13**	**-**	**2**
PC16. install and configure software according to IDU (Indoor Unit-Modem)	-	1	-	1
PC17. ensure that the computer or server where the software will be installed meets the minimum requirements specified by the manufacturer like hardware specifications, operating system compatibility, and available storage space	1	2	-	-
PC18. physically connect the IDU modem to the computer or server using the appropriate interface, such as Ethernet, USB, or serial connection	-	2	-	-
PC19. access the management software or configuration interface provided by the manufacturer to configure network settings for the IDU modem which include IP address, subnet mask, default gateway, and any other network parameters required for communication with other devices or networks	1	1	-	-
PC20. check for any available firmware or software updates for the IDU modem	1	2	-	-
PC21. verify the connectivity between the IDU modem and the satellite network or other associated devices	1	2	-	-
PC22. perform tests to ensure proper signal acquisition, data transmission, and system functionality	1	1	-	-
PC23. maintain a record of the software installation and configuration details, including any changes made to default settings	-	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. regularly monitor the performance and health of the IDU modem software	-	1	-	1
Network Configuration and Connectivity	**6**	**15**	**-**	**2**
PC25. access modem with master IP in web browser	-	1	-	-
PC26. master IP address is a unique address assigned to the modem or gateway device in the SATCOM network	1	1	-	-
PC27. obtain the master IP address from the network administrator or refer to the modem's documentation	-	1	-	-
PC28. connect computer with network IP modem	-	1	-	-
PC29. connect computer to the network using an Ethernet cable or via a Wi-Fi connection	-	1	-	-
PC30. open a Web Browser and use Google Chrome, Mozilla Firefox, Microsoft Edge, or Safari	-	1	-	-
PC31. exact options and menus available will depend on the specific modem model and manufacturer	1	1	-	1
PC32. set the master IP to 192.168.0.1	-	1	-	-
PC33. connect to the device or system that manages the SATCOM operations, typically a network router, switch, or satellite modem	1	2	-	-
PC34. enter the appropriate username and password to log in to the configuration interface	1	1	-	-
PC35. look for the IP address configuration settings. This can typically be found under a section called "LAN Settings," "Network Setup," or similar.	1	2	-	1
PC36. along with the IP address, and need to specify the subnet mask and default gateway	1	1	-	-
PC37. apply IP assignment on laptop or computer	-	1	-	-
System Libraries and Files	**6**	**12**	**-**	**3**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC38. identify and understand features of system libraries and files related to be installed	-	1	-	-
PC39. consult system manuals, documentation, and vendor-provided information to understand the required libraries and files for installation and operation	1	1	-	-
PC40. review the system requirements provided by the SATCOM system vendor or manufacturer	-	1	-	1
PC41. examine the SATCOM system's architecture and components to identify any specific libraries and files associated with each component	1	1	-	1
PC42. review the release notes and change logs provided by the SATCOM system vendor	1	1	-	-
PC43. look for system libraries, configuration files, and any additional files that are essential for SATCOM operations	1	1	-	-
PC44. conduct thorough testing to ensure that all required system libraries and files are present and functioning correctly	1	1	-	-
PC45. regularly check for new versions of libraries and files associated with the system to ensure that you are using the latest and most stable versions	1	2	-	-
PC46. use mutimeter for voltage measurement	-	3	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6267
NOS Name	Install of Antenna at remote end and establish link
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	4
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N6268: Set up and Operate Ground Station

Description

This OS unit is about various activities carried out while setting up ground station.

Scope

The scope covers the following :

- Ground Station Antenna Installation and Alignment
- Antenna Tracking and Pointing

Elements and Performance Criteria

Ground Station Antenna Installation and Alignment

To be competent, the user/individual on the job must be able to:

PC1. properly install and align the ground station antenna, thermal control system, power system, attitude and orbit control system to achieve the required gain and polarization, ensuring optimal signal reception and transmission

PC2. choose an appropriate location for the ground station antenna that provides a clear line of sight to the satellite

PC3. install a sturdy and stable mounting structure, such as a tripod, tower, or rooftop platform, that can support the weight and size of the antenna

PC4. position the antenna on the mounting structure while ensuring that it is level and plumb

PC5. use a bubble level or inclinometer to achieve precise positioning

PC6. determine the azimuth angle required to align the antenna with the satellite

PC7. determine the elevation angle required for the antenna to point toward the satellite

PC8. fine-tune the antenna's azimuth, elevation, and polarization adjustments by referring to a signal strength meter or receiver connected to the antenna

PC9. use the appropriate equipment, such as a spectrum analyzer or satellite signal meter, to verify the signal quality and strength

PC10. monitor the signal parameters, including Signal-to-Noise Ratio (SNR), Carrier-to-Noise Ratio (C/N), and Bit Error Rate (BER), to ensure optimal signal reception

PC11. securely fasten all mounting brackets, bolts, and nuts to ensure that the antenna remains stable and maintains its alignment over time

PC12. implement proper grounding for the antenna system to protect against electrical hazards and lightning strikes

PC13. connect the grounding wire to a designated ground point or grounding rod as per local electrical codes and safety guidelines

Antenna Tracking and Pointing

To be competent, the user/individual on the job must be able to:

PC14. Perform accurate tracking and pointing of the antenna towards the satellite, maintaining precise azimuth and elevation angles for a stable communication link

PC15. technical identify the specifications of the antenna, including its range of motion, azimuth, and elevation angles, and any associated tracking mechanisms or software

PC16. Gather information about the satellite that intend to communicate with, including its orbital parameters, position in the sky, and azimuth and elevation angles required for optimal signal reception

PC17. identify the initial position from which to start tracking the satellite

PC18. Ensure that the azimuth and elevation indicators on the antenna and tracking system are calibrated and accurate. This may involve using reference markers, measuring instruments, or software tools to align the indicators properly

PC19. adjust the azimuth and elevation angles of the antenna, keeping an eye on the signal strength or quality indicators

PC20. utilize tracking software or mechanisms provided with the ground station setup

PC21. monitor the signal strength and quality indicators while making adjustments to the antenna's position

PC22. make small adjustments to further refine the antenna's position. Pay attention to any fluctuations in signal strength or quality and make slight changes to maintain the best possible communication link

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. frequency bands used in satellite communication

KU2. modulation techniques employed in satellite communication

KU3. different satellite orbits and their characteristics

KU4. link budgets and their importance in satellite communication

KU5. propagation characteristics and their impact on satellite communication

KU6. different components in a ground station, such as antennas, transceivers, amplifiers, modems, routers, switches, and power systems

KU7. functions and roles of each component in the ground station setup

KU8. commonly used communication protocols in SATCOM, such as TCP/IP, UDP, SNMP, and satellite-specific protocols

KU9. communication protocols in establishing network connectivity and ensuring interoperability with other systems

KU10. different components of a ground station setup

KU11. interconnections and dependencies between various components

KU12. satellite tracking techniques used to maintain communication links

KU13. frequency allocation regulations and their impact on SATCOM operations

KU14. licensing procedures and requirements for satellite communication

KU15. protocols for handling equipment in a ground station

KU16. electrical safety practices and protocols in a ground station environment

KU17. security measures in SATCOM operations

KU18. control mechanisms to prevent unauthorized access

KU19. spectrum usage regulations and compliance
KU20. data protection regulations and compliance in SATCOM operations

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. understanding of project need
GS2. assignment of band width
GS3. in the text , voice and video
GS4. communicate with client for specific need
GS5. either need of intranet or internet
GS6. sound knowledge of LAN and wireless devices
GS7. liaising and coordination skills
GS8. probe customers using appropriate open and close ended questions to understand the nature of problem, without any pre-conclusions
GS9. plan the development activities
GS10. organize all hardware/software components required for setup
GS11. plan testing and deployment activities
GS12. time and work management
GS13. read and comprehend/understand equipment installation manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Ground Station Antenna Installation and Alignment	**20**	**35**	**-**	**7**
PC1. properly install and align the ground station antenna, thermal control system, power system, attitude and orbit control system to achieve the required gain and polarization, ensuring optimal signal reception and transmission	2	4	-	1
PC2. choose an appropriate location for the ground station antenna that provides a clear line of sight to the satellite	2	3	-	1
PC3. install a sturdy and stable mounting structure, such as a tripod, tower, or rooftop platform, that can support the weight and size of the antenna	1	2	-	-
PC4. position the antenna on the mounting structure while ensuring that it is level and plumb	1	4	-	1
PC5. use a bubble level or inclinometer to achieve precise positioning	2	2	-	1
PC6. determine the azimuth angle required to align the antenna with the satellite	1	2	-	1
PC7. determine the elevation angle required for the antenna to point toward the satellite	2	4	-	-
PC8. fine-tune the antenna's azimuth, elevation, and polarization adjustments by referring to a signal strength meter or receiver connected to the antenna	2	2	-	-
PC9. use the appropriate equipment, such as a spectrum analyzer or satellite signal meter, to verify the signal quality and strength	2	2	-	-
PC10. monitor the signal parameters, including Signal-to-Noise Ratio (SNR), Carrier-to-Noise Ratio (C/N), and Bit Error Rate (BER), to ensure optimal signal reception	1	2	-	1
PC11. securely fasten all mounting brackets, bolts, and nuts to ensure that the antenna remains stable and maintains its alignment over time	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. implement proper grounding for the antenna system to protect against electrical hazards and lightning strikes	2	2	-	-
PC13. connect the grounding wire to a designated ground point or grounding rod as per local electrical codes and safety guidelines	1	4	-	1
Antenna Tracking and Pointing	**10**	**25**	**-**	**3**
PC14. Perform accurate tracking and pointing of the antenna towards the satellite, maintaining precise azimuth and elevation angles for a stable communication link	1	3	-	-
PC15. technical identify the specifications of the antenna, including its range of motion, azimuth, and elevation angles, and any associated tracking mechanisms or software	1	4	-	1
PC16. Gather information about the satellite that intend to communicate with, including its orbital parameters, position in the sky, and azimuth and elevation angles required for optimal signal reception	2	2	-	-
PC17. identify the initial position from which to start tracking the satellite	1	4	-	1
PC18. Ensure that the azimuth and elevation indicators on the antenna and tracking system are calibrated and accurate. This may involve using reference markers, measuring instruments, or software tools to align the indicators properly	1	2	-	-
PC19. adjust the azimuth and elevation angles of the antenna, keeping an eye on the signal strength or quality indicators	1	4	-	-
PC20. utilize tracking software or mechanisms provided with the ground station setup	1	2	-	-
PC21. monitor the signal strength and quality indicators while making adjustments to the antenna's position	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. make small adjustments to further refine the antenna's position. Pay attention to any fluctuations in signal strength or quality and make slight changes to maintain the best possible communication link	1	2	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6268
NOS Name	Set up and Operate Ground Station
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	2
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N6269: Signal Analysis, Ground Station Maintenance, and Security Implementation

Description

This OS unit is about analysing signals, maintaining ground station, and implementing security.

Scope

The scope covers the following :

- Maintenance and Inspection
- Signal Quality Monitoring and Analysis
- Security Measures Implementation

Elements and Performance Criteria

Maintenance and Inspection

To be competent, the user/individual on the job must be able to:

PC1. conduct regular maintenance and inspections of the ground station equipment, including antenna, feed system, tracking mechanisms, and associated electronics, to ensure proper functioning and reliability

PC2. establish a maintenance schedule that outlines the frequency and tasks for inspecting and maintaining the ground station equipment

PC3. verify the antenna alignment periodically to ensure it is pointing accurately towards the satellite

PC4. check the tracking mechanisms, such as azimuth and elevation systems, for proper calibration

PC5. inspect all cables and connectors for signs of damage, wear, or loose connections

PC6. verify the electrical system components, including power supplies, grounding, surge protection devices, and wiring connections

PC7. functional tests on the ground station equipment to ensure proper functioning and alignment

Signal Quality Monitoring and Analysis

To be competent, the user/individual on the job must be able to:

PC8. monitor and analyze signal quality parameters such as Signal-to-Noise Ratio (SNR), Bit Error Rate (BER), and Carrier-to-Noise Ratio (C/N) to assess and optimize the performance of the communication link

PC9. use appropriate tools and equipment to measure signal quality parameters such as Signal-to-Noise Ratio (SNR), Bit Error Rate (BER), and Carrier-to-Noise ratio (C/N)

PC10. connect the monitoring equipment to the relevant points in the ground station setup

PC11. keep the monitoring equipment running to continuously monitor the signal quality parameters during operation

PC12. maintain a record of the measured signal quality parameters at regular intervals

PC13. use the recorded data to analyze the signal quality parameters over time.

Security Measures Implementation

To be competent, the user/individual on the job must be able to:

PC14. implement appropriate security measures, including access controls, encryption protocols, and intrusion detection systems, to protect the ground station and the communication link from unauthorized access and cyber threats

PC15. access levels and user roles based on job responsibilities and the principle of least privilege

PC16. update access control policies to ensure they align with the evolving security requirements

PC17. deploy intrusion detection and prevention systems to monitor network traffic and identify potential security breaches or unauthorized activities

PC18. configure the IDPS to detect and alert on suspicious network events, such as unauthorized access attempts, network scanning, or abnormal traffic patterns

PC19. implement automated response mechanisms within the IDPS to block or mitigate identified threats in real-time

PC20. install firewalls to enforce network security policies and control traffic entering and leaving the ground station network

PC21. update and patch all software, firmware, and operating systems used in the ground station setup

PC22. develop an incident response plan outlining the steps to be taken in the event of a security breach or cyber-attack

PC23. establish backup and disaster recovery procedures to ensure timely recovery and continuity of operations in case of a security incident or system failure

PC24. implement continuous monitoring tools to track and analyze network activity, system logs, and security events in real-time

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Principles and theories behind signal-to-noise ratio (SNR), bit error rate (BER), and carrier-to-noise ratio (C/N) calculations

KU2. How to effectively use various measurement tools, both hardware and software, to measure and analyze SNR, BER, and C/N in a ground station setup

KU3. Detailed knowledge of the ground station setup, including the layout, components, and how to configure and calibrate them for optimal signal reception and transmission

KU4. Procedures for accurately recording signal quality parameters at regular intervals, and techniques to analyze this data over time to identify trends and patterns

KU5. Best practices for conducting routine maintenance, including inspections, alignments, and calibrations, to ensure equipment reliability and performance

KU6. Strategies and techniques for identifying, diagnosing, and resolving signal quality issues effectively and efficiently

KU7. Basics of network security, encryption protocols, and access controls to understand how to implement security measures in the ground station setup

KU8. Knowledge of potential cyber threats, attack vectors, and strategies to respond effectively to security breaches or attempted unauthorized access

KU9. Awareness of relevant laws, regulations, and compliance requirements related to satellite communication and data security

KU10. Effective communication and collaboration within a team to ensure everyone is informed about their roles and responsibilities regarding maintenance, signal quality monitoring, and security measures

KU11. Importance of maintaining accurate records and documentation for maintenance, signal quality assessments, security measures, and incident response for auditing and future improvements

KU12. Protocols and procedures for swift action during emergencies, including disaster recovery plans to ensure minimal downtime and rapid system restoration in case of failures or security incidents

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. understanding of project need

GS2. assignment of band width

GS3. in the text , voice and video

GS4. communicate with client for specific need

GS5. either need of intranet or internet

GS6. sound knowledge of LAN and wireless devices

GS7. liaising and coordination skills

GS8. probe customers using appropriate open and close ended questions to understand the nature of problem, without any pre-conclusions

GS9. plan the development activities

GS10. organize all hardware/software components required for setup

GS11. plan testing and deployment activities

GS12. time and work management

GS13. read and comprehend/understand equipment installation manual

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Maintenance and Inspection	**10**	**20**	**-**	**4**
PC1. conduct regular maintenance and inspections of the ground station equipment, including antenna, feed system, tracking mechanisms, and associated electronics, to ensure proper functioning and reliability	2	3	-	-
PC2. establish a maintenance schedule that outlines the frequency and tasks for inspecting and maintaining the ground station equipment	1	3	-	1
PC3. verify the antenna alignment periodically to ensure it is pointing accurately towards the satellite	1	3	-	1
PC4. check the tracking mechanisms, such as azimuth and elevation systems, for proper calibration	2	3	-	-
PC5. inspect all cables and connectors for signs of damage, wear, or loose connections	1	3	-	1
PC6. verify the electrical system components, including power supplies, grounding, surge protection devices, and wiring connections	2	3	-	-
PC7. functional tests on the ground station equipment to ensure proper functioning and alignment	1	2	-	1
Signal Quality Monitoring and Analysis	**5**	**10**	**-**	**2**
PC8. monitor and analyze signal quality parameters such as Signal-to-Noise Ratio (SNR), Bit Error Rate (BER), and Carrier-to-Noise Ratio (C/N) to assess and optimize the performance of the communication link	1	3	-	-
PC9. use appropriate tools and equipment to measure signal quality parameters such as Signal-to-Noise Ratio (SNR), Bit Error Rate (BER), and Carrier-to-Noise ratio (C/N)	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. connect the monitoring equipment to the relevant points in the ground station setup	1	1	-	-
PC11. keep the monitoring equipment running to continuously monitor the signal quality parameters during operation	-	2	-	1
PC12. maintain a record of the measured signal quality parameters at regular intervals	1	1	-	-
PC13. use the recorded data to analyze the signal quality parameters over time.	1	1	-	1
Security Measures Implementation	**15**	**30**	**-**	**4**
PC14. implement appropriate security measures, including access controls, encryption protocols, and intrusion detection systems, to protect the ground station and the communication link from unauthorized access and cyber threats	1	2	-	1
PC15. access levels and user roles based on job responsibilities and the principle of least privilege	1	2	-	-
PC16. update access control policies to ensure they align with the evolving security requirements	2	2	-	-
PC17. deploy intrusion detection and prevention systems to monitor network traffic and identify potential security breaches or unauthorized activities	3	4	-	-
PC18. configure the IDPS to detect and alert on suspicious network events, such as unauthorized access attempts, network scanning, or abnormal traffic patterns	1	2	-	1
PC19. implement automated response mechanisms within the IDPS to block or mitigate identified threats in real-time	1	2	-	-
PC20. install firewalls to enforce network security policies and control traffic entering and leaving the ground station network	1	3	-	-
PC21. update and patch all software, firmware, and operating systems used in the ground station setup	1	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. develop an incident response plan outlining the steps to be taken in the event of a security breach or cyber-attack	1	2	-	1
PC23. establish backup and disaster recovery procedures to ensure timely recovery and continuity of operations in case of a security incident or system failure	2	5	-	-
PC24. implement continuous monitoring tools to track and analyze network activity, system logs, and security events in real-time	1	3	-	-
NOS Total	**30**	**60**	**-**	**10**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6269
NOS Name	Signal Analysis, Ground Station Maintenance, and Security Implementation
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	2
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N6270: Manage Network Operation Centre (NOC) or Hub

Description

This OS unit is about Cross verification of remote data with respect of destination route with providing all rules or access to remote from NOC

Scope

The scope covers the following :

- Gateway ID Implementation and Management
- Data Connectivity and Signal Strength
- Performance Analysis and Testing
- Database Management and Monitoring
- Network Configuration and Management
- Antenna and Transceiver Selection

Elements and Performance Criteria

Gateway ID Implementation and Management

To be competent, the user/individual on the job must be able to:

PC1. implement gateway ID and assign a unique gateway ID to each SATCOM gateway in the network

PC2. determine the format and structure of the gateway ID

PC3. integrate the gateway ID information into Network Management System (NMS) or operations support systems

PC4. implement configuration management processes to track and manage changes to gateway IDs

PC5. utilize the gateway IDs to monitor the performance and troubleshoot any issues with the SATCOM gateways

PC6. incorporate security measures into the gateway ID implementation and conduct periodic audits to verify the accuracy and validity of gateway IDs

Data Connectivity and Signal Strength

To be competent, the user/individual on the job must be able to:

PC7. create a site-code or folder for organizing SATCOM-related data

PC8. store data to internal and external storage systems

PC9. test data connectivity and ensure that the satellite signal strength is strong enough for reliable transmission

PC10. use a satellite signal meter or spectrum analyzer to measure signal strength and confirm it meets required specifications

PC11. check the alignment of the satellite antenna to ensure it is accurately pointed towards the desired satellite

Performance Analysis and Testing

To be competent, the user/individual on the job must be able to:

PC12. perform a link budget analysis to assess expected performance of the satellite link

PC13. set up a test environment with necessary equipment, including a satellite modem or transceiver

PC14. use specialized network testing tools or software to generate traffic and measure data transfer rates

PC15. perform ping or latency tests to measure round-trip time for data packets between the ground station and remote location

PC16. monitor the data connection for errors or anomalies, using appropriate tools to measure error rate and bit error rate (BER) of transmitted data

PC17. simulate link failures or switchovers and verify that data connectivity is maintained without significant interruptions

PC18. perform field tests at different locations within the coverage area to assess data connectivity under varying conditions

Database Management and Monitoring

To be competent, the user/individual on the job must be able to:

PC19. design a database schema that reflects specific requirements of SATCOM operations

PC20. create a relational database using a Database Management System (DBMS) and import relevant data from various sources

PC21. utilize the Network Management System (NMS) to monitor and manage the SATCOM network

PC22. collect and analyze performance data using the database and NMS, including signal strength, link utilization, latency, and throughput

PC23. implement fault management features within the NMS to detect and respond to anomalies

PC24. leverage the database to store and manage configurations of SATCOM devices

PC25. apply commands to query data from the database

Network Configuration and Management

To be competent, the user/individual on the job must be able to:

PC26. configure IP addresses, ensuring no overlap or conflicts and determining subnet masks for each subnet

PC27. set up network monitoring tools to monitor performance, availability, and security of the SATCOM network

PC28. configure DHCP (Dynamic Host Configuration Protocol) for IP address allocation

PC29. configure SATCOM devices with their respective static IP addresses, subnet masks, and other network parameters

PC30. provide Content Providers and resolvers to interface with customers

PC31. assign LAN IP addresses and provide network names

PC32. configure NATing (Network Address Translation) for address translation between private and public networks

PC33. monitor Rx and TX of remote site at regular interval

PC34. control data rate or data packages as required

PC35. backup NMS for data protection and disaster recovery

PC36. add routes on specific routing tables as needed

Antenna and Transceiver Selection

To be competent, the user/individual on the job must be able to:

PC37. choose appropriate antennas with high gain and narrow beamwidth for improved RX and TX signals
PC38. conduct thorough frequency planning to select suitable frequencies for SATCOM operations
PC39. analyze interference patterns and ensure compatibility with the desired satellite system
PC40. invest in high-quality transceivers with excellent RX sensitivity and TX power output

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. project Management concepts and applications
KU2. combination of alphanumeric characters or a specific numbering scheme
KU3. site wise data manipulation
KU4. factors such as satellite transmit power, receiver sensitivity, antenna gain, cable losses, atmospheric conditions, and link distance
KU5. test data from the ground station and verify that it is received correctly at the remote location
KU6. factors such as terrain, vegetation, and weather conditions that may affect the satellite signal quality and data connectivity
KU7. map network elements, monitor link performance, detect faults, and provide real-time alerts
KU8. IP addresses to the connected devices
KU9. SHE and OHS guidelines and regulations as per companys norms
KU10. type of application testing methodologies and associated processes
KU11. debugging methodologies and re-testing process
KU12. compliance process/procedures and tests for hosting application or finaacle at remote end
KU13. tools for application functional and security testing
KU14. understand the MAC (Media Access Control) concept

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. taking backup of all data daily
GS2. maintain proper records as per given format
GS3. read technical documentation
GS4. communicate with customer
GS5. listen and coordinate with others
GS6. probe customers using appropriate open and close ended questions to Understand the nature of problem, without any pre-conclusions
GS7. plan the development activities
GS8. manage time and work
GS9. analyse results and debug
GS10. formulate test strategy and test case

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Gateway ID Implementation and Management	**5**	**10**	**-**	**2**
PC1. implement gateway ID and assign a unique gateway ID to each SATCOM gateway in the network	1	2	-	-
PC2. determine the format and structure of the gateway ID	1	2	-	-
PC3. integrate the gateway ID information into Network Management System (NMS) or operations support systems	1	2	-	-
PC4. implement configuration management processes to track and manage changes to gateway IDs	-	2	-	1
PC5. utilize the gateway IDs to monitor the performance and troubleshoot any issues with the SATCOM gateways	1	1	-	-
PC6. incorporate security measures into the gateway ID implementation and conduct periodic audits to verify the accuracy and validity of gateway IDs	1	1	-	1
Data Connectivity and Signal Strength	**4**	**5**	**-**	**2**
PC7. create a site-code or folder for organizing SATCOM-related data	-	1	-	-
PC8. store data to internal and external storage systems	1	1	-	-
PC9. test data connectivity and ensure that the satellite signal strength is strong enough for reliable transmission	1	1	-	1
PC10. use a satellite signal meter or spectrum analyzer to measure signal strength and confirm it meets required specifications	1	1	-	-
PC11. check the alignment of the satellite antenna to ensure it is accurately pointed towards the desired satellite	1	1	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Performance Analysis and Testing	**5**	**10**	**-**	**2**
PC12. perform a link budget analysis to assess expected performance of the satellite link	-	2	-	-
PC13. set up a test environment with necessary equipment, including a satellite modem or transceiver	1	1	-	1
PC14. use specialized network testing tools or software to generate traffic and measure data transfer rates	1	1	-	-
PC15. perform ping or latency tests to measure round-trip time for data packets between the ground station and remote location	1	2	-	-
PC16. monitor the data connection for errors or anomalies, using appropriate tools to measure error rate and bit error rate (BER) of transmitted data	1	1	-	-
PC17. simulate link failures or switchovers and verify that data connectivity is maintained without significant interruptions	1	1	-	1
PC18. perform field tests at different locations within the coverage area to assess data connectivity under varying conditions	-	2	-	-
Database Management and Monitoring	**5**	**10**	**-**	**-**
PC19. design a database schema that reflects specific requirements of SATCOM operations	-	1	-	-
PC20. create a relational database using a Database Management System (DBMS) and import relevant data from various sources	1	2	-	-
PC21. utilize the Network Management System (NMS) to monitor and manage the SATCOM network	1	2	-	-
PC22. collect and analyze performance data using the database and NMS, including signal strength, link utilization, latency, and throughput	-	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. implement fault management features within the NMS to detect and respond to anomalies	1	1	-	-
PC24. leverage the database to store and manage configurations of SATCOM devices	1	-	-	-
PC25. apply commands to query data from the database	1	2	-	-
Network Configuration and Management	**5**	**13**	**-**	**2**
PC26. configure IP addresses, ensuring no overlap or conflicts and determining subnet masks for each subnet	1	2	-	-
PC27. set up network monitoring tools to monitor performance, availability, and security of the SATCOM network	-	2	-	1
PC28. configure DHCP (Dynamic Host Configuration Protocol) for IP address allocation	1	1	-	-
PC29. configure SATCOM devices with their respective static IP addresses, subnet masks, and other network parameters	-	2	-	-
PC30. provide Content Providers and resolvers to interface with customers	-	-	-	-
PC31. assign LAN IP addresses and provide network names	1	1	-	-
PC32. configure NATing (Network Address Translation) for address translation between private and public networks	-	-	-	-
PC33. monitor Rx and TX of remote site at regular interval	-	1	-	1
PC34. control data rate or data packages as required	1	1	-	-
PC35. backup NMS for data protection and disaster recovery	-	1	-	-
PC36. add routes on specific routing tables as needed	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Antenna and Transceiver Selection	**6**	**12**	**-**	**2**
PC37. choose appropriate antennas with high gain and narrow beamwidth for improved RX and TX signals	1	2	-	1
PC38. conduct thorough frequency planning to select suitable frequencies for SATCOM operations	2	4	-	-
PC39. analyze interference patterns and ensure compatibility with the desired satellite system	2	3	-	-
PC40. invest in high-quality transceivers with excellent RX sensitivity and TX power output	1	3	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6270
NOS Name	Manage Network Operation Centre (NOC) or Hub
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	3
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N6271: Incident management or PM Activity

Description

This OS unit is about Incident Maintenance Activity or Primitive maintenance (PM Activity)

Scope

The scope covers the following :

- Down Call Analysis
- Signal Strength and Antenna Alignment

Elements and Performance Criteria

Down Call Analysis

To be competent, the user/individual on the job must be able to:

PC1. understand the cause of the down call

PC2. examine the SATCOM equipment for any signs of malfunction or failure

PC3. inspect transceivers, modems, routers, or other components that may contribute to the down call

PC4. analyze potential sources of interference, including adjacent satellites, other communication systems, or electromagnetic interference

PC5. perform tests such as ping tests, latency measurements, or Bit Error Rate (BER) calculations to further pinpoint the cause of the down call utilizing diagnostic tools or software

Signal Strength and Antenna Alignment

To be competent, the user/individual on the job must be able to:

PC6. assess the satellite signal strength using a satellite signal meter or spectrum analyzer to ensure it meets the required specifications

PC7. confirm the alignment of the satellite antenna to ensure it is accurately pointing towards the desired satellite

PC8. measure the strength of the satellite signal using a satellite signal meter or spectrum analyzer

PC9. verify the alignment of the satellite antenna to ensure it is accurately pointed towards the desired satellite

PC10. perform a link budget analysis to assess the expected performance of the satellite link

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. common cause of down calls

KU2. parameters such as signal power, path loss, antenna gain, and interference to identify any deficiencies

KU3. traffic or network bottlenecks can result in down calls in satellite connections

KU4. factors such as path loss, satellite power, antenna gains, and cable losses to ensure reliable communication

KU5. appropriate tools to measure the error rate and Bit Error Rate (BER) of the transmitted data

KU6. evaluate performance in different weather conditions, terrain, or interference scenarios

KU7. escalation matrix for reporting identified incidents, trouble or emergencies e.g. system failures, fire and power failures

KU8. SHE & OHS guidelines and regulations as per company's norms

KU9. providing customer to network monitoring access if needed

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. fill up appropriate technical forms, activity logs in required format of the company

GS2. maintain proper records as per given format

GS3. read and understand manuals, work orders, health and safety instructions, memos, reports etc.

GS4. courteous to the customers

GS5. licensing and coordination skills

GS6. communicate with supervisor and peers

GS7. installing tools and portal activity

GS8. work systematically with required attention to detail and adherence to all safety requirements

GS9. read and comprehend/understand equipment installation manual

GS10. interpreting hardware requirement at site

GS11. technical support to field engineers

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Down Call Analysis	**15**	**30**	**-**	**5**
PC1. understand the cause of the down call	3	6	-	1
PC2. examine the SATCOM equipment for any signs of malfunction or failure	3	6	-	1
PC3. inspect transceivers, modems, routers, or other components that may contribute to the down call	3	6	-	1
PC4. analyze potential sources of interference, including adjacent satellites, other communication systems, or electromagnetic interference	3	6	-	1
PC5. perform tests such as ping tests, latency measurements, or Bit Error Rate (BER) calculations to further pinpoint the cause of the down call utilizing diagnostic tools or software	3	6	-	1
Signal Strength and Antenna Alignment	**15**	**30**	**-**	**5**
PC6. assess the satellite signal strength using a satellite signal meter or spectrum analyzer to ensure it meets the required specifications	3	6	-	1
PC7. confirm the alignment of the satellite antenna to ensure it is accurately pointing towards the desired satellite	3	6	-	1
PC8. measure the strength of the satellite signal using a satellite signal meter or spectrum analyzer	3	6	-	1
PC9. verify the alignment of the satellite antenna to ensure it is accurately pointed towards the desired satellite	3	6	-	1
PC10. perform a link budget analysis to assess the expected performance of the satellite link	3	6	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6271
NOS Name	Incident management or PM Activity
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	3
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N6272: Network Management, Performance Optimization and Testing

Description

This OS unit is about communicating with superiors and colleagues as well as customers and other stakeholders in own or other work groups within as well as outside the organisation

Scope

The scope covers the following :

- Network Configuration and Monitoring
- Performance Analysis and Testing
- Database and NMS Utilization
- Industry Associations and Testing

Elements and Performance Criteria

Network Configuration and Monitoring

To be competent, the user/individual on the job must be able to:

PC1. check the network configuration, including IP addresses, subnet masks, routing tables, and NATing settings

PC2. analyze network traffic using monitoring tools to identify any abnormal patterns, high packet loss, or congestion

PC3. verify the data connectivity between the SATCOM gateway and remote locations

PC4. monitor the data connection for errors or anomalies

PC5. conduct field tests at different locations within the coverage area to assess data connectivity under varying conditions

Performance Analysis and Testing

To be competent, the user/individual on the job must be able to:

PC6. perform a link budget analysis to assess the expected performance of the satellite lin

PC7. generate traffic and measure the data transfer rates using specialized network testing tools or software

PC8. simulate link failures or switchovers to verify that data connectivity is maintained without significant interruptions

Database and NMS Utilization

To be competent, the user/individual on the job must be able to:

PC9. utilize a Database management System (DBMS) and Network Management System (NMS) to collect and analyze performance data

PC10. monitor signal strength, link utilization, latency, and throughput to identify any anomalies or areas for improvement

Industry Associations and Testing

To be competent, the user/individual on the job must be able to:

PC11. inspect industry associations such as the International Telecommunication Union (ITU), Global VSAT Forum (GVF), or Satellite Industry Association (SIA)

PC12. perform testing of SATCOM accessories

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. networking principles, including IP addressing, subnetting, routing, and NATing, to effectively configure and manage satellite communication networks

KU2. various network monitoring tools and how to use them to analyze traffic, detect abnormalities, high packet loss, congestion, and ensure optimal network performance

KU3. methods to verify data connectivity between the SATCOM gateway and remote locations to ensure seamless communication

KU4. techniques to monitor data connections for errors, anomalies, and irregularities that could affect network performance

KU5. procedures for conducting field tests in diverse locations within the coverage area to assess and optimize data connectivity under varying conditions

KU6. principles and methodologies of link budget analysis to predict and assess the expected performance of satellite communication links

KU7. tools and methods to generate traffic and accurately measure data transfer rates using specialized network testing tools or software

KU8. techniques to simulate link failures or switchovers to ensure data connectivity is maintained without significant interruptions during adverse conditions

KU9. utilizing Database Management Systems (DBMS) and Network Management Systems (NMS) to efficiently collect, manage, and analyze performance data

KU10. monitoring signal strength, link utilization, latency, and throughput to identify anomalies and areas for performance improvement

KU11. knowledge of relevant industry associations such as ITU, GVF, or SIA, and understanding the standards and best practices they advocate in the satellite communication sector

KU12. procedures and protocols for testing various SATCOM accessories to ensure their proper functionality and compatibility within the communication network

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. fill up appropriate technical forms, activity logs in required format of the company

GS2. maintain proper records as per given format

GS3. read and understand manuals, work orders, health and safety instructions, memos, reports etc

GS4. corteous to the customers

GS5. licensing and coordination skills

GS6. communicate with supervisor and peers

GS7. installing tools and portal activity

GS8. work systematically with required attention to detail and adherence to all safety requirements

GS9. read and comprehend/understand equipment installation manual

GS10. interpreting hardware requirement at site

GS11. technical support to field engineers

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Network Configuration and Monitoring	**15**	**20**	**-**	**4**
PC1. check the network configuration, including IP addresses, subnet masks, routing tables, and NATing settings	3	4	-	-
PC2. analyze network traffic using monitoring tools to identify any abnormal patterns, high packet loss, or congestion	3	4	-	1
PC3. verify the data connectivity between the SATCOM gateway and remote locations	3	4	-	1
PC4. monitor the data connection for errors or anomalies	3	4	-	1
PC5. conduct field tests at different locations within the coverage area to assess data connectivity under varying conditions	3	4	-	1
Performance Analysis and Testing	**10**	**20**	**-**	**2**
PC6. perform a link budget analysis to assess the expected performance of the satellite lin	3	7	-	1
PC7. generate traffic and measure the data transfer rates using specialized network testing tools or software	4	6	-	-
PC8. simulate link failures or switchovers to verify that data connectivity is maintained without significant interruptions	3	7	-	1
Database and NMS Utilization	**3**	**10**	**-**	**2**
PC9. utilize a Database management System (DBMS) and Network Management System (NMS) to collect and analyze performance data	1	5	-	1
PC10. monitor signal strength, link utilization, latency, and throughput to identify any anomalies or areas for improvement	2	5	-	1
Industry Associations and Testing	**2**	**10**	**-**	**2**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. inspect industry associations such as the International Telecommunication Union (ITU), Global VSAT Forum (GVF), or Satellite Industry Association (SIA)	1	5	-	1
PC12. perform testing of SATCOM accessories	1	5	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N6272
NOS Name	Network Management, Performance Optimization and Testing
Sector	Telecom
Sub-Sector	Passive Infrastructure
Occupation	Network Operation and Maintenance
NSQF Level	5
Credits	2
Version	1.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

TEL/N9104: Manage Work, Resources and Safety at workplace

Description

This OS unit is about planning work and implementing sustainable as well as healthy practices for safety and optimal use of resources

Scope

The scope covers the following :

- Manage learning and self-direction
- Develop critical thinking and problem solving
- Perform work as per quality standards
- Maintain safe and secure working environment
- Comply with material / energy / electricity conservation practices

Elements and Performance Criteria

Manage learning and self-direction

To be competent, the user/individual on the job must be able to:

PC1. develop technical and personal skills to be updated with new technologies prevalent in the industry

PC2. train the team such that they are able to adapt latest products/services in their working environment

PC3. identify opportunities for team building workshops and motivational trainings

Develop critical thinking and problem solving

To be competent, the user/individual on the job must be able to:

PC4. guide the team to be accountable for timely completion of tasks

PC5. analyse problems accurately to be able to correctly suggest suitable solutions to the concerned persons

PC6. train the team to estimate the cause of the problem and validate

Perform work as per quality standards

To be competent, the user/individual on the job must be able to:

PC7. implement ways to keep immediate as well as team's work area clean and tidy

PC8. maintain efficiency and productivity while performing role/responsibility

PC9. supervise the team to ensure that the work is done as per the assigned and agreed requirements

PC10. create schedules and rosters for the team to ensure they understand individual work requirements

Maintain safe and secure working environment

To be competent, the user/individual on the job must be able to:

PC11. identify organisation’s health, safety, security policies and procedures

PC12. instruct team to report any identified breaches in health, safety, and security policies and procedures to the designated person

PC13. manage hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority

PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected

Material / energy / electricity conservation practices

To be competent, the user/individual on the job must be able to:

PC15. implement ways to optimize usage of material including water in various tasks/activities/processes

PC16. supervise the team to ensure responsible use of resources

PC17. motivate the team to carry out routine cleaning of tools, machine and equipment

PC18. guide the team to optimize use of electricity/energy in various tasks/activities/processes

PC19. implement periodic checks of the functioning of the equipment/machine and rectify wherever required

PC20. guide the team to report malfunctioning and lapses in maintenance of equipment

PC21. implement ways to use electrical equipment and appliances properly

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. strategies pertinent to the field that can be used to pursue an advancement of skills

KU2. key performance indicators for the new tasks

KU3. feedback processes and formats

KU4. timelines and goals as well as their relevance to work allocated

KU5. importance of quality and timely delivery of the product/service

KU6. layout of the workstation and equipment used

KU7. escalation matrix and its importance, especially in case of emergencies

KU8. ways of time and cost management

KU9. rules/regulation for maintaining health and safety at workplace

KU10. meaning of hazard, different types of health and safety hazards found in the workplace, risks and threats based on the nature of work

KU11. procedures to report breaches in health, safety and security

KU12. ways of managing resources and material efficiently

KU13. ways to recognize common electrical problems and common practices of conserving electricity

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. explore various pathways to expand one's own learning skills and abilities

GS2. analyse feedback for improving one's way of working
GS3. interpret feedback from superiors in a constructive way
GS4. identify the root cause of problems
GS5. understand the problem by asking significant questions to clarify the various points of view on the problem
GS6. seek clarifications from superior about the job requirement
GS7. work in a team with full coordination of team members
GS8. read instructions/guidelines and Standard Operating Practices (SOP) documents
GS9. complete tasks efficiently and accurately within stipulated time
GS10. record data in statutory documents relevant to safety and hygiene
GS11. escalate/refer all anomalies to the concerned persons
GS12. identify the most suitable course of action for completing the task using provided resources

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Manage learning and self-direction	**4**	**5**	**-**	**-**
PC1. develop technical and personal skills to be updated with new technologies prevalent in the industry	2	1	-	-
PC2. train the team such that they are able to adapt latest products/services in their working environment	1	2	-	-
PC3. identify opportunities for team building workshops and motivational trainings	1	2	-	-
Develop critical thinking and problem solving	**4**	**7**	**-**	**-**
PC4. guide the team to be accountable for timely completion of tasks	2	3	-	-
PC5. analyse problems accurately to be able to correctly suggest suitable solutions to the concerned persons	1	2	-	-
PC6. train the team to estimate the cause of the problem and validate	1	2	-	-
Perform work as per quality standards	**5**	**9**	**-**	**4**
PC7. implement ways to keep immediate as well as team's work area clean and tidy	1	2	-	-
PC8. maintain efficiency and productivity while performing role/responsibility	1	2	-	2
PC9. supervise the team to ensure that the work is done as per the assigned and agreed requirements	1	2	-	1
PC10. create schedules and rosters for the team to ensure they understand individual work requirements	2	3	-	1
Maintain safe and secure working environment	**12**	**13**	**-**	**2**
PC11. identify organisation’s health, safety, security policies and procedures	3	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. instruct team to report any identified breaches in health, safety, and security policies and procedures to the designated person	3	3	-	-
PC13. manage hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority	3	4	-	1
PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	3	3	-	1
Material / energy / electricity conservation practices	**15**	**16**	**-**	**4**
PC15. implement ways to optimize usage of material including water in various tasks/activities/processes	1	2	-	1
PC16. supervise the team to ensure responsible use of resources	2	2	-	1
PC17. motivate the team to carry out routine cleaning of tools, machine and equipment	2	2	-	1
PC18. guide the team to optimize use of electricity/energy in various tasks/activities/processes	3	4	-	-
PC19. implement periodic checks of the functioning of the equipment/machine and rectify wherever required	2	2	-	1
PC20. guide the team to report malfunctioning and lapses in maintenance of equipment	3	2	-	-
PC21. implement ways to use electrical equipment and appliances properly	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	TEL/N9104
NOS Name	Manage Work, Resources and Safety at workplace
Sector	Telecom
Sub-Sector	Generic
Occupation	Generic
NSQF Level	5
Credits	1
Version	2.0
Last Reviewed Date	31/01/2024
Next Review Date	31/01/2027
NSQC Clearance Date	31/01/2024

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC5. recognize the significance of 21st Century Skills for employment

PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings

GS3. behave politely and appropriately with all
GS4. how to work in a virtual mode
GS5. perform calculations efficiently
GS6. solve problems effectively
GS7. pay attention to details
GS8. manage time efficiently
GS9. maintain hygiene and sanitization to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**2**	**4**	**-**	**-**
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	**1**	**2**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	**2**	**2**	**-**	**-**
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**2**	**-**	**-**
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	**2**	**3**	**-**	**-**
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	**3**	**4**	**-**	**-**
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Entrepreneurship	**2**	**3**	**-**	**-**
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	**1**	**2**	**-**	**-**
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**2**	**3**	**-**	**-**
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	29/03/2023
Next Review Date	29/03/2028
NSQC Clearance Date	29/03/2023

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council.

2. Element/Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/PC.

3. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

5. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

6. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

7. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.

8. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N6267.Install of Antenna at remote end and establish link	30	60	-	10	100	20
TEL/N6268.Set up and Operate Ground Station	30	60	-	10	100	15
TEL/N6269.Signal Analysis, Ground Station Maintenance, and Security Implementation	30	60	-	10	100	15
TEL/N6270.Manage Network Operation Centre (NOC) or Hub	30	60	-	10	100	10
TEL/N6271.Incident management or PM Activity	30	60	-	10	100	10
TEL/N6272.Network Management, Performance Optimization and Testing	30	60	-	10	100	10
TEL/N9104.Manage Work, Resources and Safety at workplace	40	50	-	10	100	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	10
Total	**240**	**440**	**-**	**70**	**750**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.