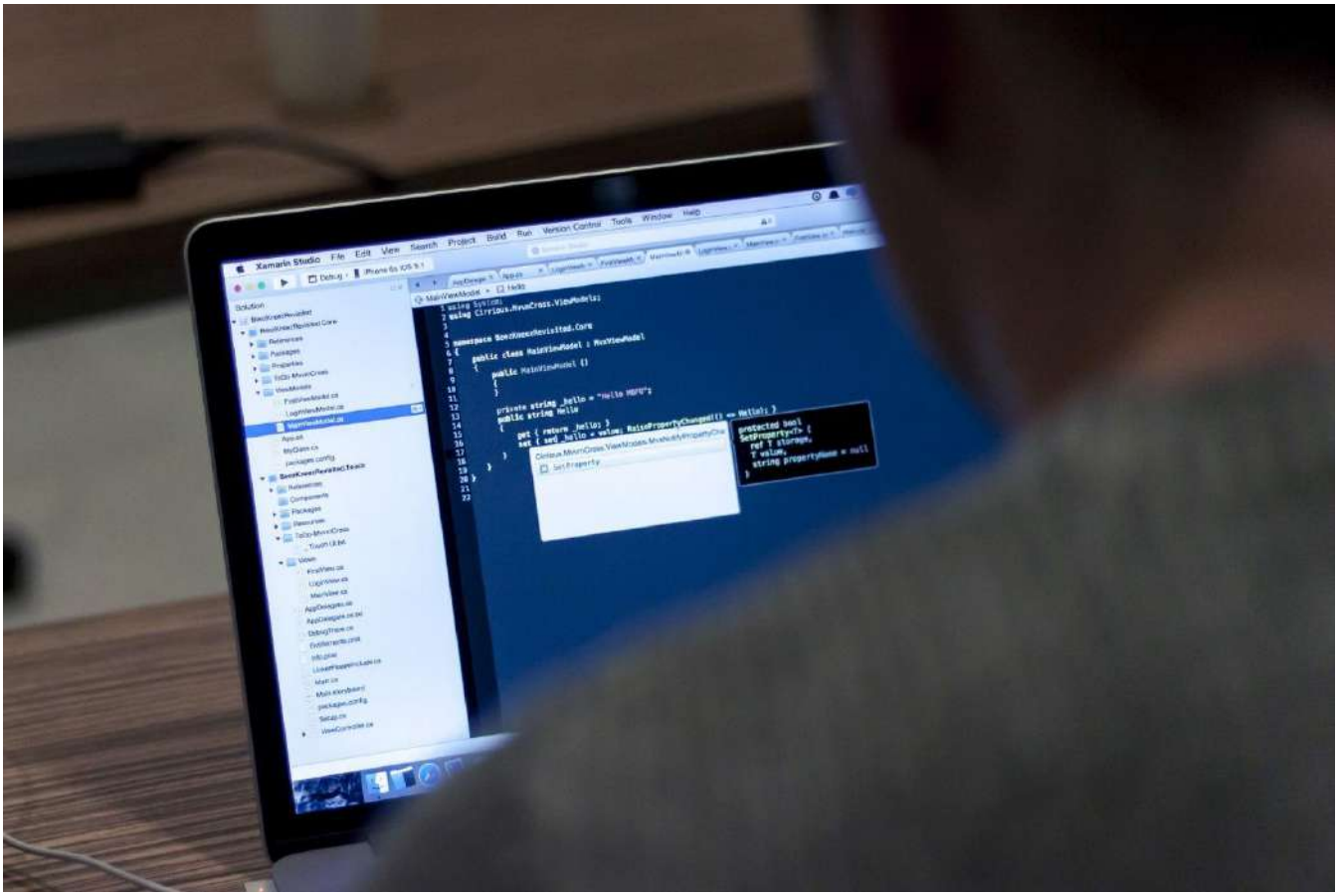
Qualification Pack



DCS Programmer & Troubleshooter

QP Code: IAS/Q5605

NSQF Level: 4

Instrumentation Automation Surveillance & Communication Sector Skill Council
201-202 STBP NSIC Complex (Gate No. 02), Okhla Industrial Area,
New Delhi-110020

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IAS/Q5605: DCS Programmer & Troubleshooter

Brief Job Description

The individual is responsible for programming logic of DCS and graphic screens for controlling various processes of industries and finding and fixing errors or faults, if any, during the operation of the process plant.

Personal Attributes

This job requires discipline and attention to details, interdisciplinary aptitude and ability to learn. The person should be willing to work for long hours to meet deadlines and should be able to cope with pressure.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. IAS/N5614: Develop DCS program
2. IAS/N5615: Test and commission DCS project on-site
3. IAS/N5616: Troubleshoot DCS project on-site
4. IAS/N9001: Work effectively with teams
5. IAS/N9002: Maintain health and safety at workplace

Qualification Pack (QP) Parameters

Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning (Instrumentation and Automation)
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2512.0800
Minimum Educational Qualification & Experience	Diploma in Electrical/Electronics/Instrumentation/B.Sc. in Electronics
Minimum Level of Education for Training in School	NA
Pre-Requisite License or Training	NA
Minimum Job Entry Age	24 Years
Last Reviewed On	05/02/2020
Next Review Date	05/02/2024
NSQC Approval Date	NA
Version	1.0

IAS/N5614: Develop DCS program

Description

This unit is about understanding the Distributed Control System (DCS) control panel, along with DCS modules/equipment, and developing DCS program using DCS software.

Scope

This unit/task covers the following:

- Analyse requirements for the DCS control panel, DCS modules and equipment
- Identify DCS programming software and its prerequisites
- Develop the program / logic / code for the DCS controller

Elements and Performance Criteria

Analyse requirements for the DCS control panel, DCS modules and equipment

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

PC1. identify the customer requirement for the DCS control panel, including the number and type of field equipment such as switches, push buttons, lamps, relays, contactors, etc.

PC2. assist the fabrication team and technician for manufacturing panel and panel door cut-outs

PC3. illustrate the wiring diagrams between the DCS modules and the equipment used in the panel

PC4. identify the terminal base along with the numbering used in panel

PC5. power the DCS and remote panel using main power supply unit

PC6. check the signal modules and wiring between signal modules, other components, and special modules to ensure the proper functioning of DCS control panel

PC7. perform Factory Acceptance Test (FAT) on the panel

Identify DCS programming software and its prerequisites

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

PC8. collect information related to prerequisites for software installation on PC/laptops needed for programming

PC9. use the organisation/customer approved software for developing the process logics and operator interface

PC10. check the availability of communication port on PC/laptop, communication protocol cable and protocol converter to be used for communication between programming software, DCS and operator station (HMI)

PC11. analyse the basic information on different types of programming language available within the software

PC12. collect information on basic program blocks in the DCS software

PC13. Identify special programming blocks with functionalities on the operator station

PC14. collect detailed information on communication program blocks and the process for timely execution of program blocks in the controller

PC15. collect information from customer regarding the equipment and instruments used in the plant and the required automation

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Develop the program / logic / code for the DCS controller

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

PC16. use appropriate programming language as per standards

PC17. create an input-output (IO) list with comments based on the inputs given by the customer

PC18. list the hardware details of controller, remote stations and PC stations used as operator stations for DCS software

PC19. set parameters in signal modules and other remote devices for ensuring better performance in the plant

PC20. develop the program as per customer inputs and functional process description

PC21. create operator station DCS project and establish connection with the controller

PC22. develop pictures and graphic objects and provide animations as per customer's requirement and according to Piping & Instrumentation Diagram (P&ID)

PC23. develop archive system and security levels in the DCS project

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's code of conduct, culture, reporting structure, documentation policy, line of business and production policy

KU2. departments involved with installation and commissioning

KU3. quality and system of standards followed in the company

KU4. basics of electrical, electronics and instrumentation wiring, electronic indicators, switchgear and panel accessories, computer and operating systems

KU5. standard operating procedure (SOP) of the organisation for layout development

KU6. quality, standards and guidelines to be followed during project development

KU7. DCS programming software, control panel, wiring, module, equipment, control system module and technologies used in the automation process

KU8. electrical load calculations, general arrangement drawing, piping and instrumentation diagram (P&ID)

KU9. application software, installation and debugging

KU10. basics of industrial process involved (examples: oil and gas, refinery) and stages involved in the process as well as the infrastructure process (examples: water treatment plant, chilling units)

KU11. instrumentation used in the factory and its wiring concept

KU12. testing process and parameters involved in the panel testing

KU13. sources and methods for obtaining required technical information for the DCS program to be developed

KU14. IEC standards in DCS programming language

KU15. relevant regulations, standards and codes of practice, and their implications on the panel

KU16. relevant documents to be referred for optimised DCS programming

Generic Skills (GS)

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

GS1. write and read emails, letters, technical documentation, user requirements, test reports, schedules, timelines and other official documents such standards and regulatory compliance documents and drawings

GS2. discuss task lists, schedules and work-loads with customers in a simple and clear language

GS3. report issues and problems to manager/s clearly

GS4. make decisions pertaining to scope of work, readiness of the panel for supply, readiness of customer site for panel installation and changes in panel on-site

GS5. plan and organise project related to requirements, design and integration, testing, installation and commissioning, customer acceptance test and customer feedback

GS6. anticipate issues and have alternate strategy

GS7. manage relationships and maintain good rapport with customers to get detailed inputs on logic

GS8. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) to resolve delays

GS9. solve issues of co-workers who are lacking the technical know how

GS10. use the existing information for improving / optimising the project and arrive at actionable decision points

GS11. apply, analyse and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and act accordingly

GS12. anticipate problems, risks and opportunities and utilise these for mitigation and business optimisation

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Analyse requirements for the DCS control panel, DCS modules and equipment	**13**	**8**	**-**	**5**
PC1. identify the customer requirement for the DCS control panel, including the number and type of field equipment such as switches, push buttons, lamps, relays, contactors, etc.	2	-	-	-
PC2. assist the fabrication team and technician for manufacturing panel and panel door cut-outs	2	-	-	1
PC3. illustrate the wiring diagrams between the DCS modules and the equipment used in the panel	1	2	-	1
PC4. identify the terminal base along with the numbering used in panel	2	-	-	1
PC5. power the DCS and remote panel using main power supply unit	1	2	-	-
PC6. check the signal modules and wiring between signal modules, other components, and special modules to ensure the proper functioning of DCS control panel	1	-	-	1
PC7. perform Factory Acceptance Test (FAT) on the panel	4	4	-	1
Identify DCS programming software and its prerequisites	**13**	**20**	**-**	**3**
PC8. collect information related to prerequisites for software installation on PC/laptops needed for programming	1	2	-	-
PC9. use the organisation/customer approved software for developing the process logics and operator interface	2	2	-	-
PC10. check the availability of communication port on PC/laptop, communication protocol cable and protocol converter to be used for communication between programming software, DCS and operator station (HMI)	1	2	-	-
PC11. analyse basic information on different types of programming language available within the software	1	2	-	-
PC12. collect information on basic program blocks in the DCS software	1	1	-	1
PC13. identify special programming blocks with functionalities on the operator station	1	2	-	1
PC14. collect detailed information on communication program blocks and the process for timely execution of program blocks in the controller	2	3	-	-

PC15. collect information from customer regarding the equipment and instruments used in the plant and the required automation	2	**2**	-	-
PC16. use appropriate programming language as per standards	2	4	-	1
Develop the program / logic / code for the DCS controller	**14**	**22**	**-**	**2**
PC17. prepare input-output (IO) list with comments based on the inputs given by the customer	1	4	-	-
PC18. list the hardware details of controller, remote stations and PC stations used as operator stations for DCS software	2	4	-	1
PC19. set parameters in signal modules and other remote devices for ensuring better performance in the plant	1	4	-	-
PC20. develop the program as per customer inputs and functional process description	2	2	-	-
PC21. create operator station DCS project and establish connection with the controller	4	4	-	1
PC22. develop pictures and graphic objects and provide animations as per customer's requirement and according to Piping & Instrumentation Diagram (P&ID)	2	2	-	-
PC23. develop archive system and security levels in the DCS project	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

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National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5614
NOS Name	Develop DCS program
Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning (Instrumentation and Automation)
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	
Next Review Date	
NSQC Clearance Date	

IAS/N5615: Test and commission DCS project on-site

Description

This OS unit is about testing and commissioning DCS project on-site.

Scope

This unit/task covers the following:

- Test the functionality of physical input and output
- Transfer logic to the DCS project
- Commission the program using trial runs for the process / application
- Develop the error handling program

Elements and Performance Criteria

Test the functionality of physical input and output

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

PC1. test the program using software checks like compilation

PC2. download the compilation error-free program and transfer it to the computer based internal software simulator for further checks

PC3. perform the steps to activate the respective inputs in software simulator to check the automation logic and thereby identify any error

PC4. modify the logical error, data address overlap and wrong IO address access to maximise program stability

PC5. apply further checks to eliminate the logical issues and address errors

PC6. perform the steps to activate the DCS project in runtime and carry out the input output checks on DCS systems

PC7. test the animations on the runtime screens

Transfer logic to the DCS project

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

PC8. collect information about the architecture of the DCS system in the plant

PC9. connect actual sensors and actuators to signal modules to check the hardware components

PC10. prepare PC stations by configuring and installing the required software / licenses for DCS project

PC11. perform the steps to transfer the DCS projects to respective PC stations, for example, to server PC and client PC

PC12. perform the steps to establish the connections between server PC and controller as well as server PC and client PC

Commission the program using trial runs for the process/application

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

PC13. manage permissions for execution of process through program and preliminary check of IO's

PC14. identify the availability of resources for trial runs

PC15. organise training regarding the sequence of operation in case of emergency

PC16 prepare a standard operating procedure (SOP) for the logic and DCS operation developed

PC17. create backup of the final DCS project to be submitted to the plant head

Develop the error handling program

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

PC18. identify hardware and software related errors in the plant

PC19. use appropriate programming logics to avoid non functionality of controller due to hardware errors

PC20. generate outputs from error handling program for error monitoring on DCS systems

PC21. examine the error handling programs by creating faults like supply failure, communication break, IO channel error, module failure, etc.

PC22. implement site acceptance test (SAT) and send the report to customer

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's reporting structure, documentation policy, line of business, product offerings, departments involved with engineering, quality and standards followed in the company

KU2. basics of electricity, electronics and instrumentation, computer and operating systems

KU3. standard operating procedure (SOP) of the organisation for process automation DCS testing

KU4. control system module, DCS system and technologies used in the automation process

KU5. application software, installation, testing and debugging

KU6. general arrangement drawing, piping and instrumentation diagram (P&ID)

KU7. basics of industrial process involved (examples: oil and gas, refinery) and stages involved in the process as well as the infrastructure process involved in the industry (examples: water treatment plant, chilling units)

KU8. safety aspects to be inbuilt in the DCS program and testing as per the process requirement

KU9. testing process and parameters involved in the testing

KU10. sources and methods for obtaining required technical information for the DCS program to be tested

KU11. IEC standards in DCS programming language

KU12. relevant documents to be referred for testing DCS program

Generic Skills (GS)

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

GS1. write and read emails, letters, technical documentation, user requirements, test reports, schedules, timelines and other official documents such standards and regulatory compliance documents and drawings

GS2. escalate issues and problems to managers in clear terms

GS3. make decisions pertaining to the scope of work, appropriate solution to faults in programming, readiness of DCS project for installation, and installation of program on-site

GS4. plan and organise project related requirements, design and integration, testing, installation and commissioning, customer acceptance test and customer feedback

GS5. anticipate issues and have an alternate strategy

GS6. identify needs of the customer and maintain good rapport with customers to get inputs on program testing

GS7. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)

GS8. help colleagues in solving issues especially related to technical problems

GS9. identify immediate or temporary solutions to resolve faults

GS10. use the existing information to optimise DCS program and arrive at actionable decision points

GS11. apply, analyse and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and act accordingly

GS12. anticipate problems, risks and opportunities and utilise these for optimising DCS Program

GS13. keep customers informed about progress of project development, achieve customer satisfaction and offer support whenever needed

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Test the functionality of physical input and output	**13**	**20**	**-**	**4**
PC1. test the program using software checks like compilation	2	4	-	-
PC2. download the compilation error-free program and transfer it to the computer based internal software simulator for further checks	1	-	-	-
PC3. perform the steps to activate the respective inputs in software simulator to check the automation logic and thereby identify any error	2	4	-	1
PC4. modify the logical error, data address overlap and wrong IO address access to maximise program stability	2	4	-	-
PC5. apply further checks to eliminate the logical issues and address errors	2	4	-	1
PC6. perform the steps to activate the DCS project in runtime and carry out the input output checks on DCS systems	2	2	-	1
PC7. test the animations on the runtime screens	2	2	-	1
Transfer logic to the DCS project	**10**	**10**	**-**	**4**
PC8. collect information about the architecture of the DCS system in the plant	2	2	-	1
PC9. connect actual sensors and actuators to signal modules to check the hardware components	2	2	-	1
PC10. prepare PC stations by configuring and installing the required software / licenses for DCS project	2	2	-	-
PC11. perform the steps to transfer the DCS projects to respective PC stations, for example, to server PC and client PC	2	2	-	1
PC12. perform the steps to establish the connections between server PC and controller as well as server PC and client PC	2	2	-	1
Commission the program using trial runs for the process/application	**8**	**10**	**-**	**-**
PC13. manage permissions for execution of process through program and preliminary check of IO's	1	-	-	-
PC14. identify the availability of resources for trial runs	2	3	-	-
PC15. organise training regarding the sequence of operation in case of emergency	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC16. prepare a standard operating procedure (SOP) for the logic and DCS operation developed	2	2	-	-
PC17. create backup of the final DCS project to be submitted to the plant head	2	3	-	-
Develop the error handling program	**9**	**10**	**-**	**2**
PC18. identify hardware and software related errors in the plant	1	2	-	1
PC19. use appropriate programming logics to avoid non functionality of controller due to hardware errors	2	2	-	-
PC20. generate outputs from error handling program for error monitoring on DCS systems	2	2	-	-
PC21. examine the error handling programs by creating faults like supply failure, communication break, IO channel error, module failure, etc.	2	2	-	-
PC22. implement site acceptance test (SAT) and send the report to customer	2	2	-	1
NOS Total	**40**	**50**	**-**	**10**

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National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5615
NOS Name	Test and commission DCS project on-site
Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning (Instrumentation and Automation)
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	
Next Review Date	
NSQC Clearance Date	

IAS/N5616: Troubleshoot DCS project on-site

Description

This unit is about understanding the process of troubleshooting a fault in the process plant.

Scope

This unit/task covers the following:

- Gather information about products, hardware and software
- Test hardware components and logic in DCS
- Install replaced products and schedule tasks

Elements and Performance Criteria

Gather information about products, hardware and software

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

PC1. identify the problem in the plant by checking with the supervisor/engineer

PC3. interpret the control drawing of the plant connected with the different modules

PC4. identify the availability of additional modules, equipment, electrical components as well as software and program backup on site

PC5. verify the settings of instruments and installation guidelines

PC6. check the functioning of the PC stations used for operating the plant

Test hardware component and logic in DCS

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

PC7. test the panel, signal modules and communication cables used in the plant

PC8. inspect earthing and power supply properly before troubleshooting

PC9. verify whether the controller and its module are in operating state

PC10. modify the running project program, if it is required, to rectify the faults

PC11. perform necessary checks on PC stations for smooth performance

Install replaced products and schedule tasks

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

PC12. match the product with the drawing according to the catalogue number

PC13. perform replacement of module/equipment if it is found faulty

PC14. verify the parameter of the connected load entered in controller

PC15. follow the process to monitor the parameter reading according to schedule

PC16. install, test and start the plant on-site

PC17. implement the steps to take program backup before and after troubleshooting

PC18. prepare a site report after troubleshooting and mention the remedy

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's reporting structure, documentation policy, departments involved with installation and commissioning, quality and standards followed in the company

KU2. standard operating procedure (SOP) of the organisation for troubleshooting the process plant

KU3. DCS programming software, module and equipment used in the automation process

KU4. application software, installation, commissioning, testing and debugging a DCS system

KU5. general arrangement drawing and piping and instrumentation diagram (P&ID)

KU6. safety aspects to be inbuilt in the control panel system as per the process requirement

KU7. instrumentation used in the factory and its wiring concept

KU8. electrical panel, wiring, electronics indicators, switchgear and panel accessories

KU9. testing process and parameters involved in the testing

KU10. relevant regulations, IEC standards and codes of practice, and their implications on troubleshooting

KU11. how to communicate with shop floor technicians in order to resolve any error during debugging

KU12. basic power systems, motor fundamentals and drive systems fundamentals

Generic Skills (GS)

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

GS1. identify needs of the customer, ask questions for clarity, and suggest most appropriate solution

GS2. manage relationships and maintain good rapport with customers to speed up commissioning

GS3. keep customers informed about progress in a simple and clear language, achieve customer satisfaction and offer support whenever needed

GS4. escalate issues and problems to managers in clear terms

GS5. make decisions pertaining to the scope of work, appropriate solution for customer problems, readiness of the system after solving the issues and starting of the process plant

GS6. plan and organise project related requirements, design and integration, testing, installation and commissioning, customer acceptance test and customer feedback

GS7. anticipate issues and have an alternate strategy

GS8. identify immediate or temporary solutions to resolve delays and implement the proper solution when possible

GS9. use the existing information to arrive at actionable decision points, optimise solution and bring machine/plant to running state

GS10. apply, analyse and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and act accordingly

GS11. anticipate problems, risks and opportunities and utilise these for optimising the commissioning

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Gather information about products, hardware and software	**18**	**22**	**-**	**6**
PC1. identify the problem in the plant by checking with the supervisor/engineer	3	4	-	2
PC2. interpret the control drawing of the plant connected with the different modules	2	4	-	1
PC3. identify the availability of additional modules, equipment, electrical components as well as software and program backup on site	3	4	-	1
PC4. verify the settings of instruments and installation guidelines	5	5	-	1
PC5. check the functioning of the PC stations used for operating the plant	5	5	-	1
Test hardware component and logic in DCS	**10**	**13**	-	1
PC6. test the panel, signal modules and communication cables used in the plant	2	3	**-**	**1**
PC7. inspect earthing and power supply properly before troubleshooting	2	3	-	-
PC8. verify whether the controller and its module are in operating state	2	3	-	-
PC9. modify the running project program, if it is required, to rectify the faults	2	2	-	-
PC10. perform necessary checks on PC stations for smooth performance	2	2	-	1
Install replaced products and schedule tasks	**12**	**15**	-	-
PC11. match the product with the drawing according to the catalogue number	2	3	**-**	**3**
PC12. perform replacement of module/equipment if it is found faulty	2	2	-	1
PC13. verify the parameter of the connected load entered in controller	2	2	-	-
PC14. follow the process to monitor the parameter reading according to schedule	2	2	-	1
PC15. install, test and start the plant on-site	2	2	-	-
PC16. implement the steps to take program backup before and after troubleshooting	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. prepare a site report after troubleshooting and mention the remedy	1	2	-	1
NOS Total	**40**	**50**	-	-
			-	**10**

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National Occupational Standards (NOS) Parameters

NOS Code	IAS/N5616
NOS Name	Troubleshoot DCS project on-site
Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning (Instrumentation and Automation)
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	
Next Review Date	
NSQC Clearance Date	

IAS/N9001: Work effectively with teams

Description

This NOS unit is about working co-operatively with people and groups inside and outside the organisation, using skills to achieve the team goals and objectives, and showing respect towards all customs, preferences as well as people with disability and different genders

Scope

This unit/task covers the following:

- Work as per organisational team environment
- Communicate effectively
- Co-operate with team members and superiors
- Respect customers / preferences and gender / ability differences

Elements and Performance Criteria

Work as per the organisational team environment

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

PC1. identify team objectives and goals, team members by name, their role and responsibilities, greet them appropriately and respond to their greetings

PC2. comply with organisation's policies and procedures for working with team members within and outside the organisation—especially related to privacy, confidentiality and security

PC3. work as per the environment to build trust and mutual respect

PC4. participate in decision making by providing facts and figures, give / accept constructive suggestions, take initiatives to help team members arrive at workable decisions and meet the goals

PC5. accept decisions professionally and support even if they do not match suggestions and personal views

Communicate effectively

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

PC6. communicate professionally as per organisation's protocols, using appropriate mode of communication—verbal, written, mail, phone or text—and clearly articulate the message to ensure that the receiver understands the message

PC7. listen to team members attentively, respond promptly, seek / provide clarifications if required

PC8. share important information with the team timely and refrain from overloading them with unnecessary and unsolicited information

Co-operate with team members and superiors

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

PC9. perform own role, receive inputs from others and make adjustments within permissible rules as per requirement, to produce output in time for other team members to follow

PC10. help team members to perform their role effectively and provide any clarifications/support they need, including tools /equipment / common resources as well as resolve any contentious issues amicably, involving the team lead or the supervisor if needed

PC11. let team members know in good time if commitments cannot be carried out, explaining the reasons, and provide alternate solutions, if any; let the team lead know about this

PC12. act in the interest of the team and the organisation, take initiative to correct the wrong, seek help or escalate if needed to ensure that things do not 'fall through the gap' and team goals are achieved

Respect customs / preferences and gender / ability differences

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

PC13. follow organisation's policies and statutory guidelines w.r.t seeking information about others' customs / preferences, making references or comments on social customs / preferences, and refrain from hurting sentiments

PC14. accommodate team members' preferences to the extent feasible, and in case they come in the way of fulfilling team goals, discuss with the supervisor/ team leader

PC15. ensure personal behaviour, conduct and communication styles, taking gender and disability of the person into consideration

PC16. list the different types of disabilities with their respective issues and ways to help them overcome challenges

PC17. use inclusive language, verbal as well as non-verbal, irrespective of the disability and the gender of the person

PC18. ensure equal treatment for all clients, colleagues and co-workers while respecting their personal space

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation's policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc.

KU2. organisation's hierarchy and escalation matrix

KU3. importance of the individual's role in the workflow

KU4. work area inspection procedures and practices

KU5. different types of information that colleagues might need and the importance of providing this information when it is required

KU6. deeper understanding of actions and consequences of gender based behaviour

KU7. knowledge of gender based concepts, issues and legislation

KU8. organisation standards and guidelines to be followed for PwD and knowledge about laws, acts and provisions defined for PwD by the statutory bodies and the right way to use them including various medical conditions associated with PwD

KU9. health and safety requirements at workplace for PwD and information about various institutes working for PwD to enable in providing livelihood opportunities for PwD

KU10. rights and duties at workplace with respect to PwD and various government / private schemes and benefits available for PwD

KU11. process of recruiting people for a particular job profile w.r.t PwD and gender including rights and duties at workplace with respect to gender sensitivity

Generic Skills (GS)

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

GS1. complete forms such as work orders, invoices and maintenance records

GS2. fill up appropriate forms, activity logs and attendance sheets as per the organisation's format in English and/or local language

GS3. write basic accident or incident report as witnessed in an appropriate format to the relevant authority

GS4. read warnings, instructions and other text material on product labels, components, etc.

GS5. read relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out work activities

GS6. listen effectively and orally communicate information

GS7. ask for clarification and advice from the concerned person

GS8. make decisions on a suitable course of action or response keeping in view resource utilisation while meeting

GS9. plan and organise work to achieve targets and deadlines

GS10. understand needs of the customer, suggest most appropriate solution and support them whenever needed

GS11. match symptoms of the fault noticed to the cause of the problem

GS12. anticipate and avoid hazards that may occur during repairs because of tools, materials used or repair processes

GS13. spot process disruptions and delays

GS14. practice and acceptance of gender and its concepts

GS15. develop empathy across genders and towards PwD

GS16. reflect on own gender identity, gender roles and PwD issues

GS17. engage and participate in discussions to end gender and disability discrimination

GS18. improve and modify work practices

GS19. maintain positive and effective relationships with colleagues and customers

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work as per the organisational team environment	**15**	**8**	**-**	**5**
PC1. Identify team objectives and goals, team members by name, their role and responsibilities, greet them appropriately and respond to their greetings	4	4	-	-
PC2. comply with organisation's policies and procedures for working with team members within and outside the organisation—especially related to privacy, confidentiality and security	4	-	-	2
PC3. work as per the environment to build trust and mutual respect	2	-	-	1
PC4. participate in decision making by providing facts and figures, give / accept constructive suggestions, take initiatives to help team members arrive at workable decisions and meet the goals	4	4	-	1
PC5. accept decisions professionally and support even if they do not match suggestions and personal views	1	-	-	1
Communicate effectively	**6**	**10**	**-**	**1**
PC6. communicate professionally as per organisation's protocols, using appropriate mode of communication—verbal, written, mail, phone or text—and clearly articulate the message to ensure that the receiver understands the message	2	6	-	1
PC7. listen to team members attentively, respond promptly, seek / provide clarifications if required	2	-	-	-
PC8. share important information with the team timely and refrain from overloading them with unnecessary and unsolicited information	2	4	-	-
Co-operate with team members and superiors	**8**	**18**	**-**	**1**
PC9. perform own role, receive inputs from others and make adjustments within permissible rules as per requirement, to produce output in time for other team members to follow	2	6	-	-
PC10. help team members to perform their role effectively and provide any clarifications/support they need, including tools /equipment / common resources as well as resolve any contentious issues amicably, involving the team lead or the supervisor if needed	-	6	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. let team members know in good time if commitments cannot be carried out, explaining the reasons, and provide alternate solutions, if any; let the team lead know about this	2	-	-	-
PC12. act in the interest of the team and the organisation, take initiative to correct the wrong, seek help or escalate if needed to ensure that things do not 'fall through the gap' and team goals are achieved	4	6	-	-
Respect customs / preferences and gender / ability differences	**11**	**14**	**-**	**3**
PC13. follow organisation's policies and statutory guidelines w.r.t seeking information about others' customs / preferences, making references or comments on social customs / preferences, and refrain from hurting sentiments	2	4	-	-
PC14. accommodate team members' preferences to the extent feasible, and in case they come in the way of fulfilling team goals, discuss with the supervisor/ team leader	2	-	-	1
PC15. ensure personal behaviour, conduct and communication styles, taking gender and disability of the person into consideration	2	6	-	1
PC16. list the different types of disabilities with their respective issues and ways to help them overcome challenges	1	-	-	1
PC17. use inclusive language, verbal as well as non-verbal, irrespective of the disability and the gender of the person	2	4	-	-
PC18. ensure equal treatment for all clients, colleagues and co-workers while respecting their personal space	2	-	-	-
NOS Total	**40**	**50**	**-**	**10**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N9001
NOS Name	Work effectively with teams
Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	20/02/2020
Next Review Date	20/02/2024
NSQC Clearance Date	

IAS/N9002: Maintain health and safety at workplace

Description

This OS unit is about following adequate safety procedures to make work environment safe

Scope

This unit/task covers the following:

- Adhere to standard safety procedures of the company
- Maintain good health and posture
- Effective waste management/recycling practices
- Adopt learning and self-direction
- Develop system thinking in problem solving
- Material/Resources conservation practices"

Elements and Performance Criteria

Adhere to standard safety procedures of the company

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

PC1. comply with general safety procedures and those for handling an equipment, hazardous material or tool, followed in the company

PC2. remove finger rings or any other metal objects likely to interfere with the work before working on the unit

PC3. use of safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.

PC4. escalate the issue about hazardous materials or things found in the premises or any breach of safety procedure in the company

PC5. ensure zero accidents at work

PC6. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence

PC7. participate regularly in fire drills or other safety related workshops organised by the company

Maintain good health and posture

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

PC8. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials

PC9. participate in company organised health sessions such as yoga, physiotherapy or games

PC10. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools and handling equipment such as trolleys, jacks and ladders

Effective waste management/recycling practices

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

PC11. identify recyclable and non-recyclable, and hazardous waste generated to be segregated accordingly

PC12. dispose non-recyclable waste and hazardous waste as per recommended processes

PC13. deposit recyclable and reusable material at identified location

Adopt learning and self-direction

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

PC14. understand importance of skill advancement and develop mastery

PC15. adapt product / service to meet success criteria

PC16. understand accountability for timely completion of tasks

PC17. manage to express emotions in appropriate ways at workplace and understand the cause for the emotions

Develop system thinking in problem solving

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

PC18. analyse the problem accurately and communicate different possible solutions to the problem

PC19. manage to estimate the cause of the problem and validate

Material/Resources conservation practices

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

PC20. identify ways to optimize usage of material including water and electricity / energy in various tasks/activities/processes

PC21. check for spills/leakages in various tasks/activities/processes and plug them or escalate to appropriate authority

PC22. carry out routine cleaning of tools, machines and equipment

PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required and report malfunctioning (fumes/sparks/emission/vibration/noise) or any lapse in maintenance of equipment

PC24. ensure electrical equipment and appliances are properly connected and turned off when not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's policies on incentives, delivery standards, and personnel management

KU2. company's medical policy, occupational safety and health policy, and emergency evacuation procedure

KU3. how to maintain the work area safe and secure

KU4. how to handle hazardous materials, tools and equipment

KU5. procedures to be followed during emergencies such as fire accidents, electrocution, etc.

KU6. long term value of good posture and use of appropriate handling equipment

KU7. electrical grounding practices

KU8. safety regulations and standards and how to apply these

KU9. common sources of pollution and ways to minimize it

KU10. categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

KU11. usage of different colours of dustbins

KU12. organisation's procedures for minimizing waste, waste management and methods of waste disposal

KU13. strategies pertinent to their field (such as internet searches, asking peers and managers, enrolling for courses and certifications, etc.) that can be used to pursue an advancement in their skills

KU14. key performance indicators for the new tasks

KU15. how to seek feedback from supervisor and deal in constructive manner

KU16. understand that emotions are accompanied by a physical state, thought and feeling

KU17. how to interpret timelines and goals set by the manager and break them into sub-goals and tasks

KU18. importance of quality and timely delivery of the product/service

KU19. potential hazards, risks and threats based on the nature of work

KU20. ways of efficiently managing material and water in the process

KU21. layout of the workstation and electrical and thermal equipment used

KU22. efficient and inefficient utilization of material and water

KU23. basics of electricity and prevalent energy efficient devices, ways to recognise common electrical problems, and common practices of conserving electricity

Generic Skills (GS)

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

GS1. fill up appropriate forms, activity logs and attendance sheets as per organisation's format in English and/or local language

GS2. write basic accident or incident report as witnessed in appropriate format to relevant authority and complete statutory documents relevant to safety and hygiene

GS3. read/listen and interpret information correctly from relevant instruction documents, manuals, health and safety instructions, memos, , standard operating practices (SOP) documents etc. applicable to the job, in English and/or local language

GS4. read relevant signage, warnings, labels or descriptions on equipment, etc. while carrying out work activities

GS5. question co-workers in order to understand the safety and health issues

GS6. report issues and problems relating to safety and health to managers in clear terms

GS7. make decisions pertaining to safety and health issues at workplace and inform co-workers about the same

GS8. plan and organise work conforming to the safety and health norms of the company

GS9. make decisions about escalating safety and health issues at workplace to managers

GS10. discuss problems related to safety and health, evaluate the possible solution(s) and arrive at optimum /best possible solution(s) in consultation with concerned people

GS11. use the existing information to arrive at actionable decision points, optimise solution and company business, and improve customer satisfaction

GS12. apply, analyse and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action

GS13. anticipate problems, risks and opportunities and utilise these for mitigation and business optimisation

GS14. communicate with colleagues on the significance of greening of jobs

GS15. identify cause and effect of greening of jobs

GS16. record data on waste disposal at workplace

GS17. demonstrate commitment towards self, and initiative to advance skills levels by exploring various pathways to expand one's own learning

GS18. incorporate feedback into one's mental model of task, and bring it into practice

GS19. be punctual, utilise time and manage workload efficiently

GS20. evaluate strategies to maintain, enhance or reduce the intensity of heightened emotional response

GS21. test a hypothesis about the cause of the problem

GS22. identify and ask significant questions to clarify the various points of view on the problem to better understand the problem

GS23. make timely decisions for efficient utilisation of resources

GS24. complete tasks efficiently and accurately within stipulated time

GS25. work with supervisors/team members to carry out work related tasks

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Adhere to standard safety procedures of the company	**13**	**12**	**-**	**5**
PC1. comply with general safety procedures and those for handling an equipment, hazardous material or tool, followed in the company	2	2	-	1
PC2. remove finger rings or any other metal objects likely to interfere with the work before working on the unit	2	4	-	-
PC3. use of safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	4	6	-	1
PC4. escalate the issue about hazardous materials or things found in the premises or any breach of safety procedure in the company	1	-	-	-
PC5. ensure zero accidents at work	1	-	-	1
PC6. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence	1	-	-	1
PC7. participate regularly in fire drills or other safety related workshops organised by the company	2	-	-	1
Maintain good health and posture	**4**	**10**	**-**	**2**
PC8. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials	2	4	-	1
PC9. participate in company organised health sessions such as yoga, physiotherapy or games	2	-	-	-
PC10. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools and handling equipment such as trolleys, jacks and ladders	0	6	-	1
Effective waste management/recycling practices	**2**	**8**	**-**	**1**
PC11. identify recyclable and non-recyclable, and hazardous waste generated to be segregated accordingly	2	-	-	1
PC12. dispose non-recyclable waste and hazardous waste as per recommended processes	-	4	-	-
PC13. deposit recyclable and reusable material at identified location	-	4	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Adopt learning and self-direction	**7**	-	-	-
PC14. understand importance of skill advancement and develop mastery	2	-	-	-
PC15. adapt product / service to meet success criteria	2	-	-	-
PC16. understand accountability for timely completion of tasks	2	-	-	-
PC17. manage to express emotions in appropriate ways at workplace and understand the cause for the emotions	1	-	-	-
Develop system thinking in problem solving	**4**	-	-	-
PC18. analyse the problem accurately and communicate different possible solutions to the problem	2	-	-	-
PC19. manage to estimate the cause of the problem and validate	2	-	-	-
Material/Resources conservation practices	**10**	**20**	-	**2**
PC20. identify ways to optimize usage of material including water and electricity / energy in various tasks/activities/processes	2	2	-	-
PC21. check for spills/leakages in various tasks/activities/processes and plug them or escalate to appropriate authority	2	-	-	1
PC22. carry out routine cleaning of tools, machines and equipment	2	6	-	1
PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required and report malfunctioning (fumes/sparks/emission/vibration/noise) or any lapse in maintenance of equipment	2	6	-	-
PC24. ensure electrical equipment and appliances are properly connected and turned off when not in use	2	6	-	-
NOS Total	**40**	**50**	-	**10**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	IAS/N9002
NOS Name	Maintain health and safety at workplace
Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Automation
Occupation	Installation and Commissioning
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	20/02/2020
Next Review Date	20/02/2024
NSQC Clearance Date	

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for the theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score a minimum of 70% of % aggregate marks to successfully clear the assessment.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Recommended Pass % aggregate for QP: 70

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
IAS/N5614: Develop DCS program	40	50	-	10	100	20
IAS/N5615: Test and commission DCS project on-site	40	50	-	10	100	20
IAS/N5616: Troubleshoot DCS project on-site	40	50	-	10	100	20
IAS/N9001: Work effectively with teams	40	50	-	10	100	20
IAS/N9002: Maintain health and safety at workplace	40	50	-	10	100	20
Total	**200**	**250**	**-**	**50**	**500**	**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 that together specify the technical, generic, professional and organisational specific knowledge that an individual need 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.