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Islamabad

INDUSTRIAL AUTOMATION

ASSESSMENT PACKAGE

National Vocational Certificate Level 3

Version 1 - July, 2019

NAVTTC

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INDUSTRIAL AUTOMATION

ASSESSMENT PACKAGE

National Vocational Certificate Level 3

Version 1 - July, 2019

Title of Qualification: National Vocational Certificate Level 3 in Industrial Automation(Automation Technicians)	CS Code:	Level: 3	Version: 01
Competency Standard Title: B:Develop Human Machine Interface (HMI) C: Apply Work Health and Safety Practices (WHS) D: Identify and Implement Workplace Policy and Procedures E: Communicate at Workplace	**Assessment Date (DD/MM/YY):** **Assessment Time:** 1 hour		

Guidance for Candidate	**To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.**

Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: ..... Registration/Roll Number: Candidate Signature:..... .....
Written Assessment Outcome	COMPETENT ☐ NOT YET COMPETENT ☐ Name of the Assessor: ..... Assessor's code: Signature of the Assessor:..... .....

Title of Qualification: National Vocational Certificate Level 3 in Industrial Automation(Automation Technicians)	CS Code:	Level: 3	Version: 01
Competency Standard Title: B:Develop Human Machine Interface (HMI) C: Apply Work Health and Safety Practices (WHS) D: Identify and Implement Workplace Policy and Procedures E: Communicate at Workplace	**Assessment Date (DD/MM/YY):** **Assessment Time :** 1 hour		

WRITTEN ASSESSMENT

Question	**Candidate's answer**
1. What does HMI stands for?	
2. Enlist some one bit elements used in HMI designing.	
3. What does GUI stands for?	
4. How we can record an activity using HMI.	
5. Enlist some 16 bit elements used in HMI designing.	
6. Enlist the types of HMI with respect to construction.	
7. Which type of communication cables are generally used to communicate HMI with peripheral devices?	
8. How many security levels are used in HMI?	

Question	Candidate's answer
9. Enlist most common workplace accidents?	
10. What is occupational health and hygiene?	
11. Enlist the any three types of communication?	

ANSWER KEY

Sr.	Answers
1	Human machine interface
2	• Pipes • Indicators • Various switches
3	Graphical User Interface
4	User can record an activity in HMI through history / bar graph.
5	• Moving signs • Alphabet entry and alphabet display • Numeric entry & Numeric display • Meters • Tanks
6	• Push button replacer (key pad) • Data handler (with embedded controller) • Over Seer (without embedded controller)
7	RS-485 RS-232 RS-422 RJ-45
8	7
9	• Slips, trips and falls • Being caught in or struck by moving machinery. • Transportation and vehicle-related accidents. • Fire and explosions. • Overexertion and repetitive stress injuries.
10	The definition used by IOHA is: 'Occupational Hygiene is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objective of protecting worker health and well-being and safeguarding the community at large.
11	• Verbal Communication. • Non-verbal / Interpersonal communication. • Written Communications. • Formal &Informal. • Visual Communication.

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Candidate Details	Name: ..... Registration/Roll Number: .....
Guidance for Candidate	**To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):** 1. **Assessment Task 1:** Candidate is required to develop a program of process line in PLC; integrate with PLC in HMI; design HMI as per PLC program given the assessor. Also configure the tags. 2. **Assessment Task 2:** Candidate is required to create the recipes, alarms and macros as per instruction of the assessor; perform simulation of GUI in HMI. 3. **Assessment Task 3:** Candidate is required to implement and reset different security levels in HMI as per instruction of assessor. **And complete:** 4. **Knowledge assessment test (Written or Oral)** 5. **Portfolios at the time of assessment (if any)**
Minimum Evidence Required	**During a practical assessment, under observation by an assessor, you will complete:** **Assessment Task 1** Performance Criteria 1: Select HMI hardware, software and communication cables as per requirement. Performance Criteria 2: Establish communication of HMI with other controllers. Performance Criteria 3: Design process diagram as per requirement. Performance Criteria 4: Configure tags as per requirement. Performance Criteria 5: Comply with duty of care requirements Performance Criteria 6: Use personal protective equipment according to safe work practices Performance Criteria 7: Identify hazards or WHS issues in the workplace to relevant personnel Performance Criteria 8: Assess and control risks according to own level of responsibility, in line with workplace procedures Performance Criteria 9: Identify the workplace policy & procedures Performance Criteria 10: Use various media to communicate effectively

	Assessment Task 2 Performance Criteria 1: Simulate GUI as per requirement. Performance Criteria 2: Integrate GUI as per required. Performance Criteria 3: Create recipe in HMI as instructed. Performance Criteria 4: Create alarms in HMI as required. Performance Criteria 5: Create Macros in HMI as per requirement. Performance Criteria 6: Comply with duty of care requirements Performance Criteria 7: Use personal protective equipment according to safe work practices Performance Criteria 8: Identify hazards or WHS issues in the workplace to relevant personnel Performance Criteria 9: Assess and control risks according to own level of responsibility, in line with workplace procedures Performance Criteria 10: Identify the workplace policy & procedures Performance Criteria 11: Communicate within a department Performance Criteria 12: Communicate style /manner to reflect professional standards/ awareness of appropriate cultural practices
	Assessment Task 3 Performance Criteria 1: Set security levels in HMI. Performance Criteria 2: Use personal protective equipment according to safe work practices Performance Criteria 3: Identify hazards or WHS issues in the workplace to relevant personnel Performance Criteria 4: Assess and control risks according to own level of responsibility, in line with workplace procedures Performance Criteria 5: Use various media to communicate effectively Performance Criteria 6: Work with people of different cultures / backgrounds Performance Criteria 7: Identify the workplace policy & procedures Performance Criteria 8: Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met.

Continued on following page

Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: ..... Registration/Roll Number: ..... Candidate Signature:..... .....
Assessment Outcome	COMPETENT ☐ NOT YET COMPETENT ☐ Name of the Assessor: ..... Assessor's code: ..... Signature of the Assessor:..... .....

Assessment Summary (to be filled by the assessor)							
Activity	**Method**					**Result**	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)	
Assessment Task 1	Description of assessment task 1 Candidate is required to develop a program of process line in PLC; integrate with PLC in HMI; design HMI as per PLC program given the assessor. Also configure the tags.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Select HMI hardware, software and communication cables as per requirement.			
2	Establish communication of HMI with other controllers.			
3	Design process diagram as per requirement.			
4	Configure tags as per requirement.			
5	Comply the duties regarding Health, hygiene and safety			
6	Deal with resolvable problems according to prescribed procedures			
7	Use various media to communicate effectively.			
Competent ☐		Not Yet Competent ☐		

Assessment Task 2	Description of assessment task 2 Candidate is required to create the recipes, alarms and macros as per instruction of the assessor; perform simulation of GUI in HMI.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Simulate GUI as per requirement.			
2	Integrate GUI as per required.			
3	Create recipe in HMI as instructed.			
4	Create alarms in HMI as required.			
5	Create Macros in HMI as per requirement.			
6	Comply with duty of care requirements			
7	Use personal protective equipment according to safe work practices			
8	Identify hazards or WHS issues in the workplace to relevant personnel			
9	Assess and control risks according to own level of responsibility, in line with workplace procedures			
10	Identify the workplace policy & procedures			
11	Communicate within a department			
12	Communicate style /manner to reflect professional standards/ awareness of appropriate cultural practices			

Competent ☐	Not Yet Competent ☐

Assessment Task 3	Description of assessment task 3 Candidate is required to implement and reset different security levels in HMI as per instruction of assessor.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Set security levels in HMI.			
2	Use personal protective equipment according to safe work practices			
3	Identify hazards or WHS issues in the workplace to relevant personnel			
4	Assess and control risks according to own level of responsibility, in line with workplace procedures			
5	Use various media to communicate effectively			
6	Work with people of different cultures / backgrounds			
7	Identify the workplace policy & procedures			
8	Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met.			

Competent ☐	Not Yet Competent ☐

Title of Qualification: National Vocational Certificate Level 3 in Industrial Automation (Automation Technicians)	CS Code:	Level: 3	Version: 01
Competency Standard Title: A:Perform Programmable Logic Controller Operations(PLC) C: Apply Work Health and Safety Practices (WHS) D: Identify and Implement Workplace Policy and Procedures E: Communicate at Workplace	**Assessment Date (DD/MM/YY):** **Assessment Time:** 4 hours		

Candidate Details	Name: ..... Registration/Roll Number: .....
Guidance for Candidate	**To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):** 6. **Assessment Task 1:** Candidate is required to select hardware to integrate digital instruments, analogue instruments, hydraulic and pneumatic equipment as per given instructions by assessor. 7. **Assessment Task 2:** Candidate is required to select appropriate software to make a program, as per instruction of assessor, of digital control operations and perform it via simulation / hardware; also use hydraulic / pneumatic equipment if needed. 8. **Assessment Task 3:** Candidate is required to develop a program, as per instruction of assessor, of analogue control operations and perform it via simulation / hardware; also use hydraulic / pneumatic equipment if needed. **And complete:** 9. **Knowledge assessment test (Written or Oral)** 10. **Portfolios at the time of assessment (if any)**

Minimum Evidence Required	**During a practical assessment, under observation by an assessor, you will complete:** **Assessment Task 1** Performance Criteria 1: Select tools and hardware as per requirement Performance Criteria 2: Attach modules with PLC as per requirement Performance Criteria 3: Install wiring of PLC with digital instruments Performance Criteria 4: Install wiring of PLC with analogue instruments Performance Criteria 5: Integrate pneumatic and hydraulic instruments with PLC as per requirement Performance Criteria 6: Comply with duty of care requirements Performance Criteria 7: Use personal protective equipment according to safe work practices Performance Criteria 8: Identify hazards or WHS issues in the workplace to relevant personnel Performance Criteria 9: Assess and control risks according to own level of responsibility, in line with workplace procedures Performance Criteria 10: Report hazards or WHS issues in the workplace to relevant personnel Performance Criteria 11: Document risk control actions as required Performance Criteria 12: Identify the workplace policy & procedures Performance Criteria 13: Use various media to communicate effectively
	Assessment Task 2 Performance Criteria 1: Select software as per requirement. Performance Criteria 2: Program digital control operations via simulation as per application. Performance Criteria 3: Program digital control operations with hardware as per Application Performance Criteria 4: Comply with duty of care requirements Performance Criteria 5: Use personal protective equipment according to safe work practices Performance Criteria 6: Report emergencies or incidents promptly to relevant personnel Performance criteria 7: Deal with emergencies in line with own level of responsibility Performance Criteria 8: Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met. Performance Criteria 9: Communicate orally and written

	Assessment Task 3 Performance Criteria 1: Program analogue control operations via simulation as per application. Performance Criteria 2: Program analogue control operations with hardware as per application. Performance criteria 3: Comply with duty of care requirements Performance criteria 4: Use personal protective equipment according to safe work practices Performance criteria 5: Identify the workplace policy & procedures Performance criteria 6: Use various media to communicate effectively
	Portfolios required at the time of assessment (if any) for Performance criteria 1 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 2 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 3 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 4 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 5 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 6 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 7 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 8 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 9 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 10 for the evaluation of portfolio: Report on Modes of communication at workplace Performance criteria 11 for the evaluation of portfolio: Report on Modes of communication at workplace

Continued on following page

Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: ..... Registration/Roll Number: ..... Candidate Signature:..... .....
Assessment Outcome	COMPETENT ☐ NOT YET COMPETENT ☐ Name of the Assessor: ..... Assessor's code: ..... Signature of the Assessor:..... .....

Assessment Summary (to be filled by the assessor)							
Activity	**Method**					**Result**	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement				✓			
Each Assessment Task (with performance criteria)							

Assessment Task 1	Description of assessment task 1 Candidate is required to select hardware, integrate digital instruments, analogue instruments, hydraulic and pneumatic equipment as per given instructions by assessor.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Select tools and hardware as per requirement			
2	Attach modules with PLC as per requirement			
3	Install wiring of PLC with digital instrument			
4	Install wiring of PLC with analogue instruments			
5	Integrate pneumatic and hydraulic instruments with PLC as per requirement			
6	Comply with duty of care requirements			
7	Use personal protective equipment according to safe work practices			
8	Identify hazards or WHS issues in the workplace to relevant personnel			
9	Assess and control risks according to own level of responsibility, in line with workplace procedures			
10	Report hazards or WHS issues in the workplace to relevant personnel			
11	Document risk control actions as required			
12	Identify the workplace policy & procedures			
13	Use various media to communicate effectively			

Competent ☐	Not Yet Competent ☐

Assessment Task 2	Description of assessment task 2 Candidate is required to select appropriate software to make a program, as per instruction of assessor, of digital control operations and perform it via simulation / hardware; also use hydraulic / pneumatic equipment if needed.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Select software as per requirement.			
2	Program digital control operations via simulation as per application.			
3	Program digital control operations with hardware as per application			
4	Comply with duty of care requirements			
5	Use personal protective equipment according to safe work practices			
6	Report emergencies or incidents promptly to relevant personnel			
7	Deal with emergencies in line with own level of responsibility			
8	Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met.			
9	Communicate orally and written			

Competent ☐	Not Yet Competent ☐

Assessment Task 3	Description of assessment task 3 Candidate is required to develop a program, as per instruction of assessor, of analogue control operations and perform it via simulation / hardware; also use hydraulic / pneumatic equipment if needed.

During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Program analogue control operations via simulation as per application.			
2	Program analogue control operations with hardware as per application.			
3	Comply with duty of care requirements			
4	Use personal protective equipment according to safe work practices			
5	Identify the workplace policy & procedures			
6	Use various media to communicate effectively			

Competent ☐	Not Yet Competent ☐

Portfolio (if any)	Description of portfolio Report on Report on Modes of communication at workplace
Current ☐ Sufficient ☐ Authentic ☐ Valid ☐ Reliable ☐	

Portfolio meet the following performance standards:		Yes	No	Remarks
1	Communicate within a department			
2	Communicate with other departments.			
3	Use various media to communicate effectively			
4	Communicate orally and written			
5	Deal with clients/customers			
6	Interact with other organisations			
7	Work with people of different cultures / backgrounds			
8	Identify relevant procedures for written information			
9	Use strategies to ensure correct communication in writing .i.e. • correct composition • clarity • comprehensiveness • accuracy • appropriateness			
10	Draft assigned written information for approval, ensuring it is written within designated timeframes			
11	Ensure written information meets required standards of style, format and detail			

Competent ☐	Not Yet Competent ☐

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Guidance for Candidate	**To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.**

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Candidate Details	Name: ..... Registration/Roll Number: Candidate Signature:..... .....
Written Assessment Outcome	COMPETENT ☐ NOT YET COMPETENT ☐ Name of the Assessor: ..... Assessor's code: Signature of the Assessor:..... .....

Title of Qualification: National Vocational Certificate Level 3 in Industrial Automation(Automation Technicians)	CS Code:	Level: 3	Version: 01
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WRITTEN ASSESSMENT

Question	**Candidate's answer**
12. What is PLC? Compare it with relay logic control.	
13. Enlist the types of PLC with respect to switching.	
14. Enlist the main part of PLC hardware.	
15. What is the role of I/O's module in PLC?	
16. Write the name of any four analogue modules?	
17. Which communication protocols are generally used to communicate PLC with peripheral devices?	
18. Write down the arithmetic instruction used in PLC programming.	

Question	Candidate's answer
19. What are the types of timers and counters?	
20. Which types of instructions are generally to be considered as sub routine instructions?	
21. What does PID stands for?	
22. What is SOP in safety?	
23. Write the modes of communication?	
24. What is Codes of Practice?	

ANSWER KEY

Sr.	Answers
1	Programmable logic controller that provides hardware interface for input sensors and output control elements. Relay system: • Is complicated and slow switching
	• Need more space • Can't be modified easily PLC • Compatible, solid state and fast switching • Compact system and don't need space • Easily modifiable
2	Transistor type PLC Relay type PLC Triac type PLC
3	• CPU • Memories • I/O module • Power Supply • Programming Unit
4	Electronic plug in unit used for interfacing the input and output devices in the machine or process to be controlled.
5	• PT module • Thermocouple module • Load cell module • Voice module etc
6	Modbus, Profibus, Ethernet, Industrial Ethernet, device NET, control NET, Profi NET etc.
7	Addition, subtraction, multiplication, division, mean and square root
8	Timers: Retentive timer, non retentive timer / on delay, off delay Counters: Latch counters, unlatch counters / up counters, down counter and up-down
9	• Jump instructions • Sub routine call instructions • Interrupt instructions
10	Proportional integral derivative
11	A standard operating procedure (SOP) is a set of written instructions that describes in detail how to safely perform work involving hazardous materials (biological, chemical, radiological), hazardous equipment or hazardous operations.
12	There are three modes of communication; • Interpersonal • Interpretive • Presentational.
13	Codes of practice are developed by the Commission for Occupational Safety and Health. It includes: • Ethical principles • Workplace behavior • Respect for all people • Values • An honest, unbiased and unprejudiced work environment

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Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
+92 51 9044 322
+92 51 9044 322
info@navttc.org
www.navttc.org