

Assessment Evidence Guide
For
“IoT Programmer”
Level-4
Interface Sensors and Actuators
(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level:4	Version:01
Competency Standard Title: Interface Sensors and Actuators	Assessment Date (DD/MM/YY): Assessment Time:		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to interface of Temperature Sensor and Humidity Sensor with Arduino board and display temperature and humidity readings on the display.</p> <p>Assessment Task 2: Candidate is required to Interface Occupancy Sensor and IR Sensor with Raspberry pi and detect motion in the room and display output on the display on screen.</p> <p>Assessment Task 3: Candidate is required to interface of RFID and NFC Arduino board that will read student information from and display the output.</p> <p>Assessment Task 4: Candidate is required to interface Actuators with Arduino board that will run DC motor.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Select sensor according to specification</p> <p>Performance Criteria 2: Download the datasheet to configure pins</p> <p>Performance Criteria 3: Configure sensor according to datasheet</p> <p>Performance Criteria 4: Connect the sensor in given circuit</p>

	Assessment Task 3 Performance Criteria 1: Select the sensor according to specifications Performance Criteria 2: Download the datasheet to configure pins Performance Criteria 3: Configure sensor according to datasheet Performance Criteria 4: Connect the sensor in the given circuit
	Assessment Task 4 Performance Criteria 1: Select actuator according to specifications Performance Criteria 2: Download the datasheet to configure pins Performance Criteria 3: Configure actuator according to datasheet Performance Criteria 4: Connect the sensor in the given circuit
	Portfolios required at the time of assessment (if any) for

Assessors Judgment Guide

Candidate Details	Name: Registration/Roll Number: Candidate Signature:.....
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to interface of Temperature Sensor and Humidity Sensor with Arduino board and display temperature and humidity readings on the display.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Select sensor according to specification			
2. Download the datasheet to configure pins			
3. Configure sensor according to datasheet			
4. Connect the sensor in given circuit			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	
Each Assessment Task (with performance criteria)			

Assessment Task 2	Description of Assessment Task 2 Candidate is required to Interface Occupancy Sensor and IR Sensor with Raspberry pi and detect motion in the room and display output on the display on screen.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Select sensor according to specification			
2. Configure sensor according to datasheet			
3. Connect the sensor in given circuit			
4. Connect the transmitter in the circuit			
5. Connect the receiver in the circuit			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	
Each Assessment Task (with performance criteria)			

Assessment Task 3		Description of Assessment Task 3		
		Candidate is required to interface of RFID and NFC Arduino board that will read student information from and display the output.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Select the sensor according to specifications			
2.	Download the datasheet to configure pins			
3.	Configure sensor according to datasheet			
4.	Connect the sensor in the given circuit			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		
Each Assessment Task (with performance criteria)				

Assessment Task 4		Description of Assessment Task 4		
		Candidate is required to interface Actuators with Arduino board that will run DC motor.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Select actuator according to specifications			
2.	Download the datasheet to configure pins			
3.	Configure actuator according to datasheet			
4.	Connect the sensor in the given circuit			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		
Each Assessment Task (with performance criteria)				

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Interface Sensors and Actuators	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor:..... Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. What are basic electronic components?	
2. How many types of sensors	
3. Difference between active and passive elements/sensors.	

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)

4. Define NFC
and NFC tags

5. Define interface
/ connect
temperature
sensor

6. Which protocol
is used to link
all the devices
in the IoT?

ANSWER KEY

Sr.	Answers
1.	Basic electronics components are resistance, capacitors, inductors, diodes, SCR, TRIAC etc.
2.	There are many different types of sensors, the main categories are; Position Sensors, Pressure Sensors, Temperature Sensors, Force Sensors, Vibration Sensors, Piezo Sensors.
3.	Active components are parts of a circuit that rely on an external power source to control or modify electrical signals. Passive components like resistors, transformers, and diodes don't need an external power source to function.
4.	A near field communication tag (NFC tag) is a sticker or wristband with small microchips that can be read by in range mobile devices. Information is stored in these microchips. A NFC tag has the ability to send data to other mobile phones
5.	It is a 3-terminal device that provides an analog voltage proportional to the temperature. The higher the temperature, the higher is the output voltage.
6.	The internet of Thing is the global system of interconnected computer networks that use the Internet Protocol suite (TCP/IP) to link billions of devices worldwide.

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

Apply Microcontroller Interfacing Protocols

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Apply Microcontroller Interfacing Protocols	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to connect and read data through SPI Interface in C programming language.</p> <p>Assessment Task 2: Candidate is required to connect and read data through I2C and RS232 in C programming language.</p> <p>Assessment Task 3: Candidate is required to connect and read data through Serial Communication (UART, USART) in C programming language.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Select number of pins as per requirement.</p> <p>Performance Criteria 2: Select number of packets and its format</p> <p>Performance Criteria 3: Create the packets in sequence in C programming language</p> <p>Performance Criteria 4: Connect the sensor in the circuit using SPI interface of microcontroller</p> <p>Performance Criteria 5: Read value in C programming language</p>

	<p>Assessment Task 2</p> <p>Performance Criteria 1: Select number of pins as per requirement.</p> <p>Performance Criteria 2: Select number of packets and its format</p> <p>Performance Criteria 3: Create the packets in sequence in C programming language</p> <p>Performance Criteria 4: Connect the sensor in the circuit using I2C interface of microcontroller</p> <p>Performance Criteria 5: Connect the sensor in the circuit using RS232 interface of microcontroller</p> <p>Performance Criteria 6: Read value in C programming language</p>
	<p>Assessment Task 3</p> <p>Performance Criteria 1: Select number of pins as per requirement</p> <p>Performance Criteria 2: Select number of packets and its format</p> <p>Performance Criteria 3: Create the packets in sequence in C programming language</p> <p>Performance Criteria 4: Connect the sensor in the circuit using UART, USART interface of microcontroller</p> <p>Performance Criteria 5: Read value in C programming language</p>

Assessors Judgment Guide

Candidate Details	Name: Registration/Roll Number: Candidate Signature:.....
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of Assessment Task 1 Candidate is required to connect and read data through SPI Interface in C programming language.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Select number of pins as per requirement			
2.	Select number of packets and its format			
3.	Create the packets in sequence in C programming language			
4.	Connect the sensor in the circuit using SPI interface of microcontroller			
5.	Read value in C programming language			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of Assessment Task 2		
		Candidate is required to connect and read data through I2C and RS232 in C programming language.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Select number of pins as per requirement			
2.	Select number of packets and its format			
3.	Create the packets in sequence in C programming language			
4.	Connect the sensor in the circuit using I2C interface of microcontroller			
5.	Connect the sensor in the circuit using RS232 interface of microcontroller			
6.	Read value in C programming language			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 3		Description of Assessment Task 3		
		Candidate is required to connect and read data through Serial Communication (UART, USART) in C programming language.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Select number of pins as per requirement			
2.	Select number of packets and its format			
3.	Create the packets in sequence in C programming language			
4.	Connect the sensor in the circuit using UART, USART interface of microcontroller			
5.	Read value in C programming language			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Apply Microcontroller Interfacing Protocols	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Describe main IOT components?	
2. Define UART Interface	
3. Define USART interface	
4. Explain packet format	

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
5. Define RS232	

ANSWER KEY

Sr.	Answers
1.	IOT system are the integration of four distinct components: sensors/devices, connectivity, data processing, and a user interface.
2.	A universal asynchronous receiver-transmitter is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable
3.	A Universal Synchronous/Asynchronous Receiver/Transmitter — is a microcontroller peripheral that converts incoming and outgoing bytes of data into a serial bit stream
4.	A packet consists of control information and user data; the latter is also known as the payload
5.	RS232 is device used for serial connections. It supports 9 pins.
6.	Synchronous communication happens when messages can only be exchanged in real time. Asynchronous communication happens when information can be exchanged independent of time.

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

Configure ADC and PWM of a Controller

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level:4	Version: 01
Competency Standard Title: Configure ADC and PWM of a Controller	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to write a program in C/C++ to get data from ADC channel and display results and create a PWM of 50% duty cycle frequency f=2.5kHz, XTAL=7Mhz with Arduino/NodeMCU.</p> <p>Assessment Task 2: Candidate is required to turn on and off LED for 15 seconds using relay with Raspberry Pi.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)

Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Download datasheet of required module</p> <p>Performance Criteria 2: Select ADC pins</p> <p>Performance Criteria 3: Make one ADC pin as input using C/C++ programming language</p> <p>Performance Criteria 4: Write and read value in C/C++ programming language</p> <p>Performance Criteria 5: Select Analog pins</p> <p>Performance Criteria 6: Calculate Resolution of ADC</p> <p>Performance Criteria 7: Make one ADC pin as output using C</p> <p>Performance Criteria 8: Connect LED to this Pin</p> <p>Performance Criteria 9: Examine LEDs brightness</p>
	<p>Assessment Task 2</p> <p>Performance Criteria 1: Download Pin Configuration of Raspberry Pi</p> <p>Performance Criteria 2: Select PWM pins</p> <p>Performance Criteria 3: Set identified pin as output in python</p> <p>Performance Criteria 4: Set frequency of required signal</p> <p>Performance Criteria 5: Apply this frequency on this output pin using python</p> <p>Performance Criteria 6: Connect LED to identified pin</p> <p>Performance Criteria 7: Examine LEDs brightness</p>

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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)							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to write a program in C/C++ to get data from ADC channel and display results and create a PWM of 50% duty cycle frequency $f=2.5\text{kHz}$, XTAL=7Mhz with Arduino/NodeMCU.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Download datasheet of required module			
2. Select ADC pins			
3. Make one ADC pin as input using C/C++ programming language			
4. Write and read value in C/C++ programming language			
5. Select Analog pins			
6. Calculate Resolution of ADC			
7. Make one ADC pin as output using C			
8. Connect LED to this Pin			
9. Examine LEDs brightness			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 2		Description of Assessment Task 2		
		Candidate is required to turn on and off LED for 15 seconds using relay with Raspberry Pi.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Download Pin Configuration of Raspberry Pi			
2.	Select PWM pins			
3.	Set identified pin as output in python			
4.	Set frequency of required signal			
5.	Apply this frequency on this output pin using python			
6.	Connect LED to identified pin			
7.	Examine LEDs brightness			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Make Rectifier Using Diodes	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Define the following network topologies Star, mesh and hybrid networks	
2. Identify infrastructure-based and ad-hoc networks	
3. What are the basic components of a network	

ANSWER KEY

Sr.	Answers
1.	<p>Network topology refers to the manner in which the links and nodes of a network are arranged to relate to each other.</p> <p>Star: All the computers connect with the help of a hub. Mesh: The mesh topology has a unique network design in which each computer on the network connects to every other.</p> <p>Hybrid: Hybrid topology combines two or more topologies</p>
2.	<p>In infrastructure mode, all devices on a wireless network communicate with each other through an access point (wireless router). In ad hoc mode, a computer with a wireless network adapter communicates directly with a printer equipped with a wireless print server.</p>
3.	<p>The basic network components are NIC, switch, cable, hub, router, and modem.</p>
<div>Competent <input type="checkbox"/></div> <div>Not Yet Competent <input type="checkbox"/></div>	

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

**Identify and interface wireless technologies
(WiFi, Bluetooth, BLE, Zigbee) with Micro-
controller**

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Identify and interface wireless technologies (WiFi, Bluetooth, BLE, Zigbee) with Micro-controller	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to interface Wi-Fi and Bluetooth module with a Raspberry Pi and control LEDs using mobile application.</p> <p>Assessment Task 2: Candidate is required to Interface ZigBee module with Arduino and validate its working using mobile application.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Integrate WIFI module with the controller</p> <p>Performance Criteria 2: Configure WIFI settings</p> <p>Performance Criteria 3: Establish WIFI communication between two different modules</p> <p>Performance Criteria 4: Transmit and receive Application data</p> <p>Performance Criteria 5: Integrate Bluetooth module with the controller</p> <p>Performance Criteria 6: Configure Bluetooth settings</p> <p>Performance Criteria 7: Establish Bluetooth communication between two different modules.</p> <p>Performance Criteria 8: Rectify the issues in connectivity of the device</p>

	<p>Assessment Task 2</p> <p>Performance Criteria 1: Select module identification number</p> <p>Performance Criteria 2: Download the datasheet</p> <p>Performance Criteria 3: Identify coordinator, router and endnode</p> <p>Performance Criteria 4: Configure Zigbee node as End Node</p> <p>Performance Criteria 5: Configure Zigbee Node as Coordinator</p> <p>Performance Criteria 6: Create Zigbee network</p> <p>Performance Criteria 7: Receive the data from the Zigbee Network</p>
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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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to interface Wi-Fi and Bluetooth module with a Raspberry Pi and control LEDs using mobile application.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Integrate WIFI module with the controller			
2. Configure WIFI settings			
3. Establish WIFI communication between two different modules			
4. Transmit and receive Application data			
5. Integrate Bluetooth module with the controller			
6. Configure Bluetooth settings			
7. Establish Bluetooth communication between two different modules.			
8. Rectify the issues in connectivity of the device			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 2	Description of Assessment Task 2 Candidate is required to Interface ZigBee module with Arduino and validate its working using mobile application.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Select module identification number			
2. Download the datasheet			
3. Identify coordinator, router and endnode			
4. Configure Zigbee node as End Node			
5. Configure Zigbee Node as Coordinator			
6. Create Zigbee network			
7. Receive the data from the Zigbee Network			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Identify and interface wireless technologies (WiFi, Bluetooth, BLE, Zigbee) with Micro-controller	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Which wireless technology is used for short-range communication?	
2. What is Zigbee and what are the benefits? What is Zigbee and what are the benefits?	

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)

3. What is the range of Zigbee?

4. What is difference between BLE and Bluetooth?

5. Do Android phones have BLE?

ANSWER KEY

Sr.	Answers
1.	Bluetooth is a standard protocol for short-range radio communications between many different types of devices, including mobile phones, computers, entertainment systems and other electronics.
2.	Zigbee has a mesh network topology with low cost, multi hop data transmission and is power effective. It is less complex than Bluetooth. It is easy to install. Zigbee support a large number of nodes. Zigbee is more reliable.
3.	10–100 m.
4.	Bluetooth can handle a lot of data but quickly consumes battery life and costs a lot more. Bluetooth Low Energy is used for applications that do not need to exchange large amounts of data and can run on battery power for years at a cheaper cost.
5.	Bluetooth Low Energy (BLE), available in Android 4.3 and later, creates short connections between devices to transfer bursts of data.

**Assessment Evidence
Guide
For
“IoT Programmer”
Level-4
Program Basic Building Blocks using C/C++
(Formative Assessment)**



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Program Basic Building Blocks using C/C++	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to calculate average marks of each student of a class and create a grading system based on those average marks in C++.</p> <p>Assessment Task 2: Candidate is required to print table from 5 to 10 using nested FOR/WHILE loop and create an array with 5 elements and access its element using pointer in C++.</p> <p>Assessment Task 3: Candidate is required to add math,h header file and calculate sin, cos and tan of a value.</p> <p>Assessment Task 4: Candidate is required to make one parent class as "Animal and three child classes as "Lion" "Dog" "Deer" and create a function by the name of sound for the class and apply concept of polymorphism.</p> <p>Assessment Task 5: Candidate is required to create a file and write some text in that file and display after read.</p> <p>And complete:</p> <ol style="list-style-type: none"> Knowledge assessment test (Written or Oral) Portfolios at the time of assessment (if any)

Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Install the IDE for coding</p> <p>Performance Criteria 2: Create basic program structure</p> <p>Performance Criteria 3: Declare variables according to the requirements</p> <p>Performance Criteria 4: Implement arithmetic expression in program</p> <p>Performance Criteria 5: Debug the code in case of error numeric values</p> <p>Performance Criteria 6: Create basic program structure</p> <p>Performance Criteria 7: Use decision statement as per the requirement of problem</p> <p>Performance Criteria 8: Debug the code in case of error</p> <p>Performance Criteria 9: Run the code to display the correct answer</p>
	<p>Assessment Task 2</p> <p>Performance Criteria 1: Create basic program structure</p> <p>Performance Criteria 2: Initialize loop control variable</p> <p>Performance Criteria 3: Set loop condition</p> <p>Performance Criteria 4: Set loop invariant</p> <p>Performance Criteria 5: Write the loop as per the requirement of the problem</p> <p>Performance Criteria 6: Declare and initialize array</p> <p>Performance Criteria 7: Define loop to access array</p> <p>Performance Criteria 8: Access elements of array to perform actions as per requirement of the problem</p> <p>Performance Criteria 9: Debug the code in case of error</p> <p>Performance Criteria 10: Run the code to display the correct answer</p> <p>Performance Criteria 11: Declare and initialize pointer</p> <p>Performance Criteria 12: Assign an address value to pointer</p> <p>Performance Criteria 13: Access different memory indices through this value</p> <p>Performance Criteria 14: Access elements of an array using pointers</p>

	<p>Assessment Task 3</p> <p>Performance Criteria 1: Create basic program structure</p> <p>Performance Criteria 2: Include the header file as required by the problem</p> <p>Performance Criteria 3: Call the functions instructed by task from the built-in library.</p> <p>Performance Criteria 4: Perform the task as per requirement of problem</p> <p>Performance Criteria 5: Debug the code in case of error</p> <p>Performance Criteria 6: Run the code to display the correct answer</p>
	<p>Assessment Task 4</p> <p>Performance Criteria 1: Create basic program structure</p> <p>Performance Criteria 2: Initialize the function header, with parameters and return type</p> <p>Performance Criteria 3: Declare the function, to perform the assigned task.</p> <p>Performance Criteria 4: Call the user created function as per requirement of problem</p> <p>Performance Criteria 5: Call multiple functions with different parameters and display results.</p> <p>Performance Criteria 6: Declare member functions and variables of the class</p> <p>Performance Criteria 7: Apply encapsulation (private, public) on the classes</p> <p>Performance Criteria 8: Create the objects of that class</p> <p>Performance Criteria 9: Access the functions and data of particular objects.</p> <p>Performance Criteria 10: Debug the code in case of error</p> <p>Performance Criteria 11: Run the code to display the correct answer</p> <p>Performance Criteria 12: Declare parent and child class</p> <p>Performance Criteria 13: Create an objects of child classes</p> <p>Performance Criteria 14: Access parent class function using child class objects</p> <p>Performance Criteria 15: Access the functions and data of declared objects to show polymorphic behavior</p>

	<p>Assessment Task 5</p> <p>Performance Criteria 1: Write the code to open file from program</p> <p>Performance Criteria 2: Declare member functions and variables of the classes</p> <p>Performance Criteria 3: Write data in that file from the program.</p> <p>Performance Criteria 4: Write code to open another file from program</p> <p>Performance Criteria 5: Read data from that file and display it</p> <p>Performance Criteria 6: Debug the code in case of error</p> <p>Performance Criteria 7: Run the code to display the correct answer</p>
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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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1		Description of Assessment Task 1 Candidate is required to calculate average marks of each student of a class and create a grading system based on those average marks in C++.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Install the IDE for coding			
2.	Create basic program structure			
3.	Declare variables according to the requirements			
4.	Implement arithmetic expression in program			
5.	Debug the code in case of error numeric values			
6.	Create basic program structure			
7.	Use decision statement as per the requirement of problem			
8.	Debug the code in case of error			
9.	Run the code to display the correct answer			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of Assessment Task 2		
		Candidate is required to print table from 5 to 10 using nested FOR/WHILE loop and create an array with 5 elements and access its element using pointer in C++.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Create basic program structure			
2.	Initialize loop control variable			
3.	Set loop condition			
4.	Set loop invariant			
5.	Write the loop as per the requirement of the problem			
6.	Declare and initialize array			
7.	Define loop to access array			
8.	Access elements of array to perform actions as per requirement of the problem			
9.	Debug the code in case of error			
10.	Run the code to display the correct answer			
11.	Declare and initialize pointer			
12.	Assign an address value to pointer			
13.	Access different memory indices through this value			
14.	Access elements of an array using pointers			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 3		Description of Assessment Task 3		
		Candidate is required to add math,h header file and calculate sin, cos and tan of a value.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Create basic program structure			
2.	Include the header file as required by the problem			
3.	Call the functions instructed by task from the built-in library.			
4.	Perform the task as per requirement of problem			
5.	Debug the code in case of error			
6.	Run the code to display the correct answer			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 4		Description of Assessment Task 4		
		Candidate is required to make one parent class as "Animal and three child classes as "Lion" "Dog" "Deer" and create a function by the name of sound for the class and apply concept of polymorphism.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Create basic program structure			
2.	Initialize the function header, with parameters and return type			
3.	Declare the function, to perform the assigned task.			
4.	Call the user created function as per requirement of problem			
5.	Call multiple functions with different parameters and display results.			
6.	Declare member functions and variables of the class			
7.	Apply encapsulation (private, public) on the classes			
8.	Create the objects of that class			
9.	Access the functions and data of particular objects.			
10.	Debug the code in case of error			
11.	Run the code to display the correct answer			
12.	Declare parent and child class			
13.	Create an objects of child classes			
14.	Access parent class function using child class objects			
15.	Access the functions and data of declared objects to show polymorphic behavior			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 5		Description of Assessment Task 5		
		Candidate is required to create a file and write some text in that file and display after read.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Write the code to open file from program			
2.	Declare member functions and variables of the classes			
3.	Write data in that file from the program.			
4.	Write code to open another file from program			
5.	Read data from that file and display it			
6.	Debug the code in case of error			
7.	Run the code to display the correct answer			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Program Basic Building Blocks using C/C++	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. What is IDE?	
2. Define Array, loop and function	
3. What are the Benefits of built-in libraries?	
4. Define object-oriented programming (OOP).	

ANSWER KEY

Sr.	Answers
1.	An integrated development environment (IDE) is a software suite that consolidates basic tools required to write and test software.
2.	<p>Array Functions in C is a type of data structure that holds multiple elements of the same data type.</p> <p>A loop in C is the control statement is a combination of some conditions that direct the body of the loop to execute until the specified condition becomes false.</p> <p>Function in C program is a group of statements that together perform a task. Every C program has at least one function, which is main()</p>
3.	Library functions which are also called as “built-in” functions are the functions that are already available and implemented in C++. We can directly call these functions in our program as per our requirements.
4.	Object-oriented programming has four basic concepts: encapsulation, abstraction, inheritance, and polymorphism

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

**Program Different Applications in Arduino,
Raspberry pi and NodeMCU**

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Program Different Applications in Arduino, Raspberry pi and NodeMCU	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to create a program that will blink the LED of Arduino if the output of program is positive.</p> <p>Assessment Task 2: Candidate is required to create a program that will blink LED using loop & array connected with Raspberry pi if the output is positive.</p> <p>Assessment Task 3: Candidate is required to create a program that will control three different LED using control button on NodeMCU.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)

Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Setup environment for Arduino IDE</p> <p>Performance Criteria 2: Perform LED blink with basic digital wire</p> <p>Performance Criteria 3: Perform multiple LED handling with loops and arrays</p> <p>Performance Criteria 4: Control digital input and output</p> <p>Performance Criteria 5: Test LED Fader with Analog Input handling</p> <p>Performance Criteria 6: Control Serial communication</p> <p>Performance Criteria 7: Perform interfacing with accelerometer</p> <p>Performance Criteria 8: Interrupt handling with button</p>
	<p>Assessment Task 2</p> <p>Performance Criteria 1: Setup environment for Raspberry Pi</p> <p>Performance Criteria 2: Perform LED blink with Basic digital write</p> <p>Performance Criteria 3: Handle Multiple LEDs with loops and arrays</p> <p>Performance Criteria 4: Control digital input and output</p> <p>Performance Criteria 5: Control LED's glow with Analog Input handling</p> <p>Performance Criteria 6: Perform interfacing with accelerometer</p> <p>Performance Criteria 7: Control Interrupts with push button</p>
	<p>Assessment Task 3</p> <p>Performance Criteria 1: Setup environment for NodeMCU</p> <p>Performance Criteria 2: Perform LED blink with Basic digital write</p> <p>Performance Criteria 3: Handle Multiple LEDs with loops and arrays</p> <p>Performance Criteria 4: Handle digital input and output</p> <p>Performance Criteria 5: Fade LED's glow with Analog Input handling</p> <p>Performance Criteria 6: Handle Serial communication</p> <p>Performance Criteria 7: Perform interfacing with accelerometer</p> <p>Performance Criteria 8: Control Interrupts with push button</p>

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to create a program that will blink the LED of Arduino if the output of program is positive.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Setup environment for Arduino IDE			
2. Perform LED blink with basic digital wire			
3. Perform multiple LED handling with loops and arrays			
4. Control digital input and output			
5. Test LED Fader with Analog Input handling			
6. Control Serial communication			
7. Perform interfacing with accelerometer			
8. Interrupt handling with button			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 2	Description of Assessment Task 2 Candidate is required to create a program that will blink LED using loop & array connected with Raspberry pi if the output is positive.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Setup environment for Raspberry Pi			
2. Perform LED blink with Basic digital write			
3. Handle Multiple LEDs with loops and arrays			
4. Control digital input and output			
5. Control LED's glow with Analog Input handling			
6. Perform interfacing with accelerometer			
7. Control Interrupts with push button			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 3		Description of Assessment Task 3		
		Candidate is required to create a program that will control three different LED using control button on NodeMCU.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Setup environment for NodeMCU			
2.	Perform LED blink with Basic digital write			
3.	Handle Multiple LEDs with loops and arrays			
4.	Handle digital input and output			
5.	Fade LED's glow with Analog Input handling			
6.	Handle Serial communication			
7.	Perform interfacing with accelerometer			
8.	Control Interrupts with push button			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Program Different Applications in Arduino, Raspberry pi and NodeMCU	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Define interrupt?	
2. Define serial communication	
3. Why we use basic Raspberry-Pi board?	

ANSWER KEY

Sr.	Answers
1.	An interrupt occurs when an application program terminates or requests certain services from the operating system.
2.	Serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus.
3.	The Raspberry pi is a single computer board with credit card size that can be used for many tasks that your computer does, like games, word processing, spreadsheets and also to play HD video.

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

**Perform Arduino, Raspberry Pi and
NodeMCU Interfacing with Sensors**

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Perform Arduino, Raspberry Pi and NodeMCU Interfacing with Sensors	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to perform interfacing of Bluetooth & Wi-Fi module with Arduino and create a program to control an LED with these modules.</p> <p>Assessment Task 2: Candidate is required to perform interfacing of RFID & Relay module with Raspberry pi and create a program that will toggle an LED with Relay and count read student data with RFID.</p> <p>Assessment Task 3: Candidate is required to perform interfacing of Current & Voltage sensor with NodeMCU and create a program that will read analog input with these modules.</p> <p>And complete:</p> <ol style="list-style-type: none"> 3. Knowledge assessment test (Written or Oral) 4. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Program Arduino with Bluetooth Module</p> <p>Performance Criteria 2: Program Arduino with WIFI Module</p>
	<p>Assessment Task 2</p> <p>Performance Criteria 1: Interface Raspberry PI with RFID module</p> <p>Performance Criteria 2: Interface Raspberry PI with Relay module</p>

	Assessment Task 3 Performance Criteria 1: Interface NodeMCU with Current Sensor Performance Criteria 2: Interface NodeMCU with Voltage Sensor
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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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to perform interfacing of Bluetooth & Wi-Fi module with Arduino and create a program to control an LED with these modules.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Program Arduino with Bluetooth Module			
2. Program Arduino with WIFI Module			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 2	Description of Assessment Task 2 Candidate is required to perform interfacing of RFID & Relay module with Raspberry pi and create a program that will toggle an LED with Relay and count read student data with RFID.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Interface Raspberry PI with RFID module			
2. Interface Raspberry PI with Relay module			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 3	Description of Assessment Task 3 Candidate is required to perform interfacing of Current & Voltage sensor with NodeMCU and create a program that will read analog input with these modules.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Interface NodeMCU with Current Sensor			
2. Interface NodeMCU with Voltage Sensor			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Perform Arduino, Raspberry Pi and NodeMCU Interfacing with Sensors	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Define Ultrasonic Sensor?	
2. Define RFID Module?	
3. What are Relay Module?	

ANSWER KEY

Sr.	Answers
1.	An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.
2.	RFID or Radio Frequency Identification system consists of two main components, a transponder/tag attached to an object to be identified, and a Transceiver also known as interrogator/Reader.
3.	The relay module is an electrically operated switch that can be turned on or off deciding to let current flow through or not.

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

Perform Socket Programming

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Perform Socket Programming	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to develop a code for communication between client & server and perform basic arithmetic operations defined in server-side code using socket programming.</p> <p>And complete:</p> <ol style="list-style-type: none"> 5. Knowledge assessment test (Written or Oral) 6. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Write code to open a socket.</p> <p>Performance Criteria 2: Write code to open an input stream and output stream to the socket.</p> <p>Performance Criteria 3: Read from and write to the stream according to the server's protocol.</p> <p>Performance Criteria 4: Listen for the connection on server side</p> <p>Performance Criteria 5: Start an independent thread for multiple clients</p> <p>Performance Criteria 6: Close the streams.</p> <p>Performance Criteria 7: Close the socket.</p> <p>Performance Criteria 8: Perform communication between client and server using socket programming</p> <p>Performance Criteria 9: Perform socket troubleshooting</p>

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to develop a code for communication between client & server and perform basic arithmetic operations defined in server-side code using socket programming.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Write code to open a socket.			
2. Write code to open an input stream and output stream to the socket.			
3. Read from and write to the stream according to the server's protocol.			
4. Listen for the connection on server side			
5. Start an independent thread for multiple clients			
6. Close the streams.			
7. Close the socket.			
8. Perform communication between client and server using socket programming			
9. Perform socket troubleshooting			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Perform Socket Programming	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. What is DNS servers?	
2. What is meant by socket programming?	
3. Differentiate of TCP and UDP?	

ANSWER KEY

Sr.	Answers
1.	The Domain Name System is the phonebook of the Internet. When users type Domain Name such as 'google.com' or 'nytimes.com' into web browsers, DNS is responsible for finding the correct IO address.
2.	Socket programming is a way of connecting two nodes on a network to communicate with each other.
3.	TCP is a connection-oriented protocol, whereas UDP is a connectionless protocol. A key difference between TCP and UDP is speed, as TCP is comparatively slower than UDP. Overall, UDP is a much faster, simpler, and efficient protocol, however, retransmission of lost data packets is only possible with TCP.

Assessment Evidence Guide

For

“IoT Programmer”

Level-4

**Develop Mobile Apps Using MIT APP
Inventor**

(Formative Assessment)



**National Vocational & Technical
Training Commission**

Instruction Sheet for the Candidate

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Develop Mobile Apps Using MIT APP Inventor	Assessment Date (DD/MM/YY): Assessment Time :		

Candidate Details	Name: Registration/Roll Number:
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to create an app that will switch from one screen and transfer this application to another mobile using Wi-Fi in MIT-App inventor.</p> <p>Assessment Task 2: Candidate is required to make an app which blinks flashlight when receiving an incoming call using MIT-App inventor.</p> <p>Assessment Task 3: Candidate is required to make an app that will send you a greeting message when you will get home using MIT App inventor.</p> <p>Assessment Task 4: Candidate is required to make an application that records your daily expenses on local database.</p> <p>Assessment Task 5: Candidate is required to control Arduino LED with an app created by MIT App inventor.</p> <p>And complete:</p> <ol style="list-style-type: none"> 7. Knowledge assessment test (Written or Oral) 8. Portfolios at the time of assessment (if any)

Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>Performance Criteria 1: Open the IDE for coding</p> <p>Performance Criteria 2: Code a simple hello world program</p> <p>Performance Criteria 3: Compile a code</p> <p>Performance Criteria 4: Debug the code (in case of error)</p> <p>Performance Criteria 5: Run a code on emulator</p> <p>Performance Criteria 6: Connect to mobile while WiFi and transfer app to mobile and run it.</p> <p>Performance Criteria 7: Declare variables</p> <p>Performance Criteria 8: Make basic app structure with two activities/screens</p> <p>Performance Criteria 9: Use some basic user interface controls as required by the problem</p> <p>Performance Criteria 10: Switch from one screen to next</p> <p>Performance Criteria 11: Transfer the code to mobile and execute</p>
	<p>Assessment Task 2</p> <p>Performance Criteria 1: Make user interface with a phone dialer</p> <p>Performance Criteria 2: Write the code to Initialize call on selected number</p> <p>Performance Criteria 3: Transfer the code to phone and check if the call gets connected</p>
	<p>Assessment Task 3</p> <p>Performance Criteria 1: Make user interface to show location data</p> <p>Performance Criteria 2: Code to get the location data from sensor whenever the location changes and display</p> <p>Performance Criteria 3: Transfer the code to phone and check if the call gets connected</p>
	<p>Assessment Task 4</p> <p>Performance Criteria 1: Make basic app to take some data from user.</p> <p>Performance Criteria 2: Store that data to the local DB</p> <p>Performance Criteria 3: Make another app to read data from local DB</p> <p>Performance Criteria 4: Extract data for the same DB used in first app and display it</p> <p>Performance Criteria 5: Transmit both app to mobile</p> <p>Performance Criteria 6: Run both apps in set order</p> <p>Performance Criteria 7: Ensure coordination among both apps</p>

	<p>Assessment Task 5</p> <p>Performance Criteria 1: Set up Arduino IDE</p> <p>Performance Criteria 2: Install App Inventor support for Arduino</p> <p>Performance Criteria 3: Interface Arduino with computer</p> <p>Performance Criteria 4: Transfer AIM-for-Things-Arduino101.ino to board</p> <p>Performance Criteria 5: App inventor should be able to access Arduino</p> <p>Performance Criteria 6: Check if Arduino is accessible in extensions</p> <p>Performance Criteria 7: Select LED from Arduino extensions</p> <p>Performance Criteria 8: Write code to Enable Bluetooth and blink LED on the click of the button</p> <p>Performance Criteria 9: Transfer the code to phone and test it.</p>
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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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> 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							

Observation Checklist

Assessment Task 1	Description of Assessment Task 1 Candidate is required to create an app that will switch from one screen and transfer this application to another mobile using Wi-Fi in MIT-App inventor.		
During the practical assessment, candidate demonstrated the following:	Yes	No	Remarks
1. Open the IDE for coding			
2. Code a simple hello world program			
3. Compile a code			
4. Debug the code (in case of error)			
5. Run a code on emulator			
6. Connect to mobile while WiFi and transfer app to mobile and run it.			
7. Declare variables			
8. Make basic app structure with two activities/screens			
9. Use some basic user interface controls as required by the problem			
10. Switch from one screen to next			
11. Transfer the code to mobile and execute			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>	

Assessment Task 2		Description of Assessment Task 2		
		Candidate is required to make an app which blinks flashlight when receiving an incoming call using MIT-App inventor.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Make user interface with a phone dialer			
2.	Write the code to Initialize call on selected number			
3.	Transfer the code to phone and check if the call gets connected			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 3		Description of Assessment Task 3		
		Candidate is required to make an app that will send you a greeting message when you will get home using MIT App inventor.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Make user interface to show location data			
2.	Code to get the location data from sensor whenever the location changes and display			
3.	Transfer the code to phone and check if the call gets connected			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 4		Description of Assessment Task 4		
		Candidate is required to make an application that records your daily expenses on local database.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Make basic app to take some data from user.			
2.	Store that data to the local DB			
3.	Make another app to read data from local DB			
4.	Extract data for the same DB used in first app and display it			
5.	Transmit both app to mobile			
6.	Run both apps in set order			
7.	Ensure coordination among both apps			

Assessment Task 5		Description of Assessment Task 5		
		Candidate is required to control Arduino LED with an app created by MIT App inventor.		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Set up Arduino IDE			
2.	Install App Inventor support for Arduino			
3.	Interface Arduino with computer			
4.	Transfer AIM-for-Things-Arduino101.ino to board			
5.	App inventor should be able to access Arduino			
6.	Check if Arduino is accessible in extensions			
7.	Select LED from Arduino extensions			
8.	Write code to Enable Bluetooth and blink LED on the click of the button			
9.	Transfer the code to phone and test it.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Title of Qualification: National Vocational Certificate Level 4 in IoT ("IoT Programmer")	CS Code:	Level: 4	Version: 01
Competency Standard Title: Develop Mobile Apps Using MIT APP Inventor	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

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 <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
1. Why we use Arduino platform?	
2. What is MIT App Inventor?	
3. What are the limitations of MIT App Inventor?	

ANSWER KEY

Sr.	Answers
1.	Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.
2.	MIT App Inventor is an online platform that uses mobile app development to teach computational thinking concepts.
3.	<ul style="list-style-type: none">• The user interface builder has improved but is still a bit buggy and limited, so can't build any user interface.• Limited Access to Web.• Limited Access to the device.• No polymorphic components.