

# **Assessment Evidence Guide**

**For**

**“IoT Programmer”**

**Level-4**

**(Summative Assessment)**

*Dec 2021*



**National Vocational & Technical  
Training Commission**

<b>Title of Qualification:</b> Level 4 National Qualification Certificate, in Internet of Things (IoT programmer)	CS Code:	Level: 4	Version: 01
<b>Competency Standard Title:</b> Program Basic Building blocks using C/C++ Program different applications in Arduino, Raspberry Pi and NodeMCU Perform Arduino, Raspberry Pi and NodeMCU Interfacing with Sensors Perform Socket Programming Develop mobile apps using MIT APP Inventor	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time: 3 Hours</b>		

Candidate Details	Name: .....  Registration/Roll Number: .....
Guidance for Candidate	<p><b>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration &amp; assessment):</b></p> <p><b>Assessment Task 1:</b> Candidate is required to develop C/C++ program and deploy it in Raspberry Pi (Linux already installed) to read sensor reading:</p> <p><b>And complete:</b></p> <ol style="list-style-type: none"> <li><b>Knowledge assessment test (Written or Oral)</b></li> <li><b>Portfolios at the time of assessment (if any)</b></li> </ol>
Minimum Evidence Required	<p><b>During a practical assessment, under observation by an assessor, you will complete:</b></p> <p><b>Assessment Task 1</b></p> <p>Performance Criteria 1: Configure sensor according to datasheet</p> <p>Performance Criteria 2: Connect the sensor in given circuit</p> <p>Performance Criteria 3: Connect the transmitter in the circuit</p> <p>Performance Criteria 4: Connect the receiver in the circuit</p> <p>Performance Criteria 5: Select actuator according to specifications</p> <p>Performance Criteria 6: Configure actuator according to datasheet</p> <p>Performance Criteria 7: Select number of packets and its format</p> <p>Performance Criteria 8: Create the packets in sequence in C programming language</p> <p>Performance Criteria 9: Connect the sensor in the circuit using SPI interface of microcontroller</p>

	<p>Performance Criteria 10: Connect the sensor in the circuit using I2C interface of microcontroller</p> <p>Performance Criteria 11: Connect the sensor in the circuit using UART, USART interface of microcontroller</p> <p>Performance Criteria 12: Connect the sensor in the circuit using RS232 interface of microcontroller</p> <p>Performance Criteria 13: Calculate Resolution of ADC</p> <p>Performance Criteria 14: Write and read value in C programming language</p> <p>Performance Criteria 15: Connect LED to this Pin</p> <p>Performance Criteria 16: Download Pin Configuration of Raspberry Pi</p> <p>Performance Criteria 17: Set frequency of required signal</p> <p>Performance Criteria 18: Apply this frequency on this output pin using python</p> <p>Performance Criteria 19: Integrate WIFI module with the controller</p> <p>Performance Criteria 20: Establish WIFI communication between two different modules</p> <p>Performance Criteria 21: Transmit and receive Application data</p> <p>Performance Criteria 22: Rectify the issues in connectivity of the device</p>
	<p><b>Portfolios required at the time of assessment (if any) for</b></p> <p>Performance Criteria 1: Diary log or any other evidence of work completed on Program Basic Building blocks using C/C++</p> <p>Performance Criteria 2: Diary log or any other evidence of work completed on Program different applications in Arduino, Raspberry Pi and NodeMCU</p> <p>Performance Criteria 3: Diary log or any other evidence of work completed on Perform Arduino, Raspberry Pi and NodeMCU Interfacing with Sensors</p> <p>Performance Criteria 4: Diary log or any other evidence of work completed on Perform Socket Programming</p> <p>Performance Criteria 5: Diary log or any other evidence of work completed on Develop mobile apps using MIT APP Inventor</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							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
		Candidate is required to develop C/C++ program and deploy it in Raspberry Pi (Linux already installed) to read sensor reading:		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1	Configure sensor according to datasheet			
2	Connect the sensor in given circuit			
3	Connect the transmitter in the circuit			
4	Connect the receiver in the circuit			
5	Select actuator according to specifications			
6	Configure actuator according to datasheet			
7	Select number of packets and its format			
8	Create the packets in sequence in C programming language			
9	Connect the sensor in the circuit using SPI interface of microcontroller			
10	Connect the sensor in the circuit using I2C interface of microcontroller			
11	Connect the sensor in the circuit using UART, USART interface of microcontroller			
12	Connect the sensor in the circuit using RS232 interface of microcontroller			
13	Calculate Resolution of ADC			
14	Write and read value in C programming language			
15	Connect LED to this Pin			
16	Download Pin Configuration of Raspberry Pi			
17	Set frequency of required signal			
18	Apply this frequency on this output pin using python			
19	Integrate WIFI module with the controller			
20	Establish WIFI communication between two different modules			
21	Transmit and receive Application data			
22	Rectify the issues in connectivity of the device			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

## KNOWLEDGE ASSESSMENT

<b>Title of Qualification:</b> Level 4 National Qualification Certificate, in Internet of Things (IoT programmer)	CS Code:	Level: 4	Version: 01
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Guidance for Candidate	<b>To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.</b>
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Candidate Details	Name: ..... Registration/Roll Number: ..... Candidate Signature:.....
Written Assessment Outcome	<div style="display: flex; justify-content: space-between;"> <span>COMPETENT <input type="checkbox"/></span> <span>NOT YET COMPETENT <input type="checkbox"/></span> </div> Name of the Assessor: ..... Assessor's code: ..... Signature of the Assessor:.....

<b>Questions</b> (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
Describe main IOT components?	

<b>Questions</b> (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)	
Define UART Interface	
Define the following network topologies Star, mesh and hybrid networks	
Identify infrastructure-based and ad-hoc networks	
Define RS232	
Which wireless technology is used for short-range communication?	
What is the range of Zigbee?	
What is IDE?	
Define Array, loop and function	
Why we use basic Raspberry-Pi board?	

### **ANSWER KEY**

<b>Sr.</b>	<b>Answers</b>
<b>1</b>	IOT system are the integration of four distinct components: sensors/devices, connectivity, data processing, and a user interface.
<b>2</b>	A universal asynchronous receiver-transmitter is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable
<b>3</b>	<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>
<b>4</b>	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.
<b>5</b>	RS232 is device used for serial connections. It supports 9 pins.
<b>6</b>	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.
<b>7</b>	10–100 m.
<b>8</b>	An integrated development environment (IDE) is a software suite that consolidates basic tools required to write and test software.
<b>9</b>	<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.</p> <p>Every C program has at least one function, which is main()</p>



10	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.
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