Module 1 – Part B: Assignment

Internet of Things: Theory and Applications

Assignment 2 – Module 1 – Part B – P1

Write a C++ program that initializes an integer array of numbers with the following values: 5, 10, 15, 20, 25. Then, using a loop to calculate and display the sum of all the numbers in the array.

Assignment 2 – Module 1 – Part B – P2

Write a C++ program that accepts an array of integers from the user and then calculates and displays the average of all the numbers using a function. The function should take the array and its size as parameters and return the average.

Assignment 2 – Module 1 – Part B – P3

You are given an array of integers, arr, of size n. Write a C++ program • to find the maximum product of any three integers from the array. The program should output the three integers and their product.

Assignment 2 – Module 1 – Part B – P4

Write a program that takes a string as input and counts the number of vowels (a, e, i, o, u) in the string. Use pointers to iterate through the characters of the string and a loop to iterate over all characters. Return the count of vowels.

Assignment 2 – Module 1 – Part B – P5

Write a program that calculates the sum of elements in an integer array. Use a loop to iterate over the array and accumulate the sum.

Assignment 2 – Module 1 – Part B – P6

Write a program that calculates the factorial of a given number using a loop. The factorial of a number n is the product of all positive integers from 1 to n.

Assignment 2 – Module 1 – Part B – P7

Create a Library class that represents a library. The library should have books with titles, authors, and unique IDs. Implement member functions to add books, remove books by ID, and display the details of all books in the library.

Assignment 2 – Module 1 – Part B – P8

Create a BankAccount class that represents a bank account. The account should have an account number, balance, and owner's name. Implement member functions to deposit money, withdraw money, and display the account details.

Assignment 2 – Module 1 – Part B – P9

Create a shape hierarchy with a base class called Shape. The Shape class should have a pure virtual function called area() that returns the area of the shape. Derive three classes from Shape: Circle, Rectangle, and Triangle. Implement the area() function for each derived class to calculate and return the area of the respective shape.

Assignment 2 – Module 1 – Part B – Bonus

You have been assigned a task to implement a complex sorting algorithm called "Merge Sort" using arrays, arrays as function parameters, arrays in loops, and pointers. Write a program that performs the following steps:

1) Prompt the user to enter the size of the array.

2) Dynamically allocate memory for the array based on the user's input.

3) Fill the array with random integer values between 1 and 100.

4) Display the original array.

5) Implement the Merge Sort algorithm to sort the array in ascending order.

6) Display the sorted array.

7) Find the median value of the sorted array and display it.

8) Deallocate the memory for the array.

Module 2 – Part A: Assignment

Internet of Things: Theory and Applications

Assignment: Theoretical

1) Write down a brief description of the Tensilica Xtensa LX6 Daul core microcontroller.

2) Compare micro-controllers to micro-processors with at least 5 different comparisons, is ESP32 a micro-processor and why/why not?

3) Compare digital signals to analog signal with at least 5 different comparisons.

ESP32 Projects Assignment – Problem 1

Design a bar graph display using multiple LEDs to visually represent a range of values.

The bar graph should consist of a series of LEDs that light up sequentially based on a specific condition or input.

Implement a function that maps the input values to the LED bar graph, ensuring that each LED corresponds to a specific range or threshold.

Bonus: Allow the input to be assigned from the user in the serial monitor – Perform a simulation for the circuit on Fritzing before implementing it on TinkerCAD – Design the circuit schematic on Fritzing.

ESP32 Projects Assignment – Problem 2

Connect a push button to the ESP32, which can toggle an LED on and off.

Pressing the button should turn the LED on, and releasing the button should turn it off.

Bonus: Implement a debouncing mechanism to handle any potential glitches or bounces when the button is pressed or released using pull down or pull up resistors - – Perform a simulation for the circuit on Fritzing before implementing it on TinkerCAD – Design the circuit schematic on Fritzing.

ESP32 Projects Assignment – Problem 3

Connect an LDR light sensor to the ESP32 to measure ambient light levels.

When the light level goes below a certain threshold, activate a buzzer to emit an audible alarm sound.

Simultaneously, turn on an LED to provide a visual indication of the alarm state.

Once the light level rises above the threshold, the buzzer should stop, and the LED should turn off.

Bonus: Send an alarm in the serial monitor for the user – Perform a simulation for the circuit on Fritzing before implementing it on TinkerCAD – Design the circuit schematic on Fritzing.

Bonus Projects

1) Use analog output IR sensor to measure the proximity around you with LED and buzzer alarm on any assumed threshold value.

2) Use the LCD module to print any name from the user input on serial monitor.

3) Use the ultrasonic sensor to measure any distance and print measured distance on Arduino serial with LED and Buzzer Alarm on any assumed threshold value.

4) Use the PIR sensor and print measured distance on Arduino serial with LED and Buzzer Alarm on any assumed threshold value.

5) Use the Flame sensor and print measured values on Arduino serial with LED and Buzzer Alarm on any threshold value.

6) Connect with GPS module and identify your location and print it on the Arduino IDE serial.

7) Connect with the GSM module and receive a message from your mobile then print it on the Arduino serial monitor.

Double Bonus Project

Read any analog sensor data from any sensor and print it on LCD with LED and Buzzer alarm on any assumed threshold value on this analog reading and send a twitter notification for the system user about this alarm happened.