National University of Computer and Emerging Sciences
Karachi Campus

COAL Lab (EL2003)
Date: Dec 05th 2024
Course Instructor(s)

Final Lab Exam (A)

Total Time: 2 Hour 10 minutes
<u>Includes submission</u>
Total Marks: 50
Total Questions: 04
Semester: Fall-2024
Campus: Karachi

Student Name	Roll No	Section	Student Signature

Submission Instructions:

- Name the file for each question according to Roll No e.g. k23-xxxx.txt.
- *Submission is via a client software so open the application present on the Desktop.*
- Enter your username as 23K-xxxx and its assigned password (Default is Fast1234).
- Submission is timed so after that time no submission will be accepted.
- Submissions should have 1 .txt file.
- In case of failure to submit a .txt file, you will be penalized.
- One complete MS Word Document, containing all questions source code and output screenshots.

LLO # 2:   **[10 marks - 25 minutes]**

Q1: Convert the following C code into assembly language:

```
int main() {
    int arr[5] = {1, 2, 3, 4, 5};  // Initialize the array
    int x = 10, y = 3;        // Initialize variables x and y

    // Loop through the array
    for (int i = 0; i < 5; i++) {
        if (arr[i] % 2 == 0) { // Check if the current element is even
        x = x + arr[i];     // Add the element to x
        y = y * 2;          // Double the value of y
    } else {                // If the element is odd
        x = x - arr[i];     // Subtract the element from x
        y = y + 1;          // Increment y by 1
    }
}
}
```

```
// Check the final value of x and print the result
if (x > 20) {
    printf("Final x is large: %d\n", x);
} else {
    printf("Final x is small: %d\n", x);
}
    return 0;
}
```

LLO # 2:   [10 marks - 25 minutes]

Q2: Write an Assembly Language program that allows users to input an array of integers and categorizes the numbers into the following categories:
1. Numbers that are divisible by 3.
2. Numbers that are divisible by 4.
3. Numbers that are divisible by both 3 and 4.
4. Numbers that are divisible by neither.

The program should prompt the user to enter the numbers, use procedures to perform the categorization, and display the results for each category, including the counts and the numbers in each group. The program must utilize procedures to handle input, processing, and output tasks.

Input: array = {12, 9, 15, 8, 16, 24, 27, 32, 36, 45}

Output:
Numbers divisible by 3: 12 9 15 24 27 36 45
Count: 7
Numbers divisible by 4: 12 8 16 24 32 36
Count: 6
Numbers divisible by both 3 and 4: 12 24 36
Count: 3
Numbers divisible by neither: 8 16 32
Count: 3

LLO # 2:   [15 marks - 35 minutes]

Q3: Write an assembly program to find the second-largest element in an integer array. The program should use two procedures:
1. **Procedure 1 (FindLargest):**
   o Takes the array reference and size as arguments.
   o Finds the largest element in the array and stores its value and index.
   o Calls Procedure 2 to find the second largest element, passing the array reference, size, and index of the largest element.
2. **Procedure 2 (FindSecondLargest):**
   o Takes the array reference, size, and the index of the largest element as arguments.
   o Finds the second largest element by ignoring the largest element's index.

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Input Example:
Array: [7, 3, 9, 1, 8, 2]
Output:
- Largest Element: 9
- Second Largest Element: 8

[15 marks - 35 minutes]

LLO # 2:

Q4: Write an assembly program that finds all occurrences of a substring in a larger string and replaces them with another substring of equal or smaller length.

For example:
Input String: "I like Assembly programming. Assembly is powerful."
Substring to Find: "Assembly"
Substring to Replace: "ASM"
Output: "I like ASM programming. ASM is powerful."