National University of Computer and Emerging Sciences
Karachi Campus

COAL LAB

CL-1002

Date: Dec 06th 2024

Course Instructor(s)

Mr. Muhammad Aashir, Mr. Muhammad Nadeem, Mr. Ubaidullah, Mr. Misbah

Final Exam paper A

Total Time: 2 Hours
Includes submission
Total Marks: 50
Total Questions: 04

Semester: Fall-2024
Campus: Karachi
Dept: Computer Science

Student Name	Roll No	BCS- Section	Student Signature

Submission Instructions:

- **Name the file for each question according to Roll No e.g. k23-xxxx.txt.**
- ***Submission will be done on local storage, press WIN+R and type \\172.16.5.43 after the window opens access the Exam Submissions 2024 folder and submit for ZIP file.***
- **Submissions should have 1 .txt file for each question.**

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

Q1: Convert the following C code into assembly language:

```
int main() {
    int arr[7];
    bool isPalindrome = true;

    // Input elements for the array
    printf("Enter 7 elements of the array:\n");
    for (int i = 0; i < 7; i++) {
        printf("Enter element %d: ", i+1);
        scanf("%d", &arr[i]);
    }

    // Check if the array is a palindrome
    for (int i = 0; i < 7 / 2; i++) {
        if (arr[i] != arr[6 - i]) {
            isPalindrome = false;
            break;
        }
    }

    // Display result
    if (isPalindrome) {
        printf("Hello students welcome to COAL LAb Final Exam. The array is a palindrome.\n");
    } else {
        printf("Hello students welcome to COAL LAb Final Exam. The array is not a palindrome.\n");
    }

    return 0;
```

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```
Enter 7 elements of the array:
Enter element 1: 1
Enter element 2: 2
Enter element 3: 3
Enter element 4: 4
Enter element 5: 3
Enter element 6: 2
Enter element 7: 1
```

```
Enter 7 elements of the array:
Enter element 1: 1
Enter element 2: 2
Enter element 3: 3
Enter element 4: 5
Enter element 5: 3
Enter element 6: 2
Enter element 7: 1
```

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

Q2: Write an assembly program that allows the user to input an array of 8-bit integers and categorizes the numbers into the following groups based on specific conditions:

1. **Numbers where the most significant bit (MSB) is set to 1.**
   - Identify numbers in which the leftmost bit of their binary representation is active.
2. **Numbers where the sum of their individual digits is divisible by 3.**
   - Break down the number into its individual decimal digits, compute their sum, and determine if it is divisible by 3.
3. **Numbers where cyclically shifting the bits of the number three positions to the left produces a value greater than the original number.**
   - Perform a bitwise circular shift on the binary representation of the number and compare it to the original value.
4. **Numbers that do not meet any of the above conditions.**
   - Collect all remaining numbers that do not fit into the above categories.

Example Input:

Array: {9, 12, 18, 65, 128, 240, 72, 27}

Example Output:

Condition 1	**Condition 2**	**Condition 3**	**Condition 4**
128 240	9 12 18 72 27	9 12 72 27	65
Count: 2	**Count:** 5	**Count:** 4	**Count:** 1

LLO #: 2 **[15 marks - 35 minutes]**

Q3: Write an assembly program to find the **smallest element in an array that is greater than a given threshold**. The program should use two procedures:

1. **Procedure 1 (FindSmallestAboveThreshold)**:
   - Takes the array reference, size, and threshold value as arguments.
   - Iterates through the array to find the smallest element greater than the threshold.
   - Calls Procedure 2 to compare values and update the result.
2. **Procedure 2 (CompareAndUpdate)**:
   - Takes the current smallest value and a new candidate value as arguments.
   - Updates the smallest value if the new candidate is smaller.

Input Example:

Array: [10, 15, 7, 20, 5, 8] Threshold: 8 Output: 10

LLO #: 2 **[15 marks - 35 minutes]**

Q4: Write an assembly program that finds and displays the longest palindromic substring within an input string. A palindrome reads the same forward and backward.

For example:

Input: "forgeeksskeegfor"

Output: "geeksskeeg"