Lab Session 5: Solutions

Exercise 1: 2D array

```c
/* Write a C program that takes user input to define an nxn matrix and the operation to be performed on it (+, -, *).
Then ask the user to enter the elements of each matrix. Perform the requested operation and print the value.

Written by: Sophia Bano
Date: 20/10/2023
*/

#define MAX_SIZE 10

#include <stdio.h>

int main() {
    float matrixA[MAX_SIZE][MAX_SIZE], matrixB[MAX_SIZE][MAX_SIZE];
    float result[MAX_SIZE][MAX_SIZE] = {0};
    int n, i, j, k;
    char operation;

    printf("Enter the size of the matrix: ");
    scanf("%d", &n);

    printf("Enter the operation to be performed (+, -, *): ");
    scanf(" %c", &operation);
    printf("%c entered as operator", operation);
    if (operation != '+' && operation != '-' && operation != '*') {
        printf("Invalid operation!\n");
        return 1;
    }

    printf("Enter the elements of the matrix A:\n");
    for (i = 0; i < n; i++) {
        for (j = 0; j < n; j++) {
            printf("Enter element (%d, %d): ", i + 1, j + 1);
            scanf("%f", &matrixA[i][j]);
        }
```

```
    }
    printf("Enter the elements of the matrix B:\n");
    for (i = 0; i < n; i++) {
        for (j = 0; j < n; j++) {
            printf("Enter element (%d, %d): ", i + 1, j + 1);
            scanf("%f", &matrixB[i][j]);
        }
    }

    // Performing the requested operation
    switch (operation) {
        case '+':
            // Perform matrix addition
            for (i = 0; i < n; i++) {
                for (j = 0; j < n; j++) {
                    result[i][j] = matrixA[i][j] + matrixB[i][j];
                }
            }
            break;
        case '-':
            // Perform matrix subtraction
            for (i = 0; i < n; i++) {
                for (j = 0; j < n; j++) {
                    result[i][j] = matrixA[i][j] - matrixB[i][j];
                }
            }
            break;
        case '*':
            // Perform matrix multiplication
            for (i = 0; i < n; i++) {
                for (j = 0; j < n; j++) {
                    result[i][j] = 0;
                    for (k = 0; k < n; k++) {
                        result[i][j] += matrixA[i][k] * matrixB[k][j];
                    }
                }
            }
            break;
        default:
            printf("Invalid operation!\n");
            return 1;
    }

    printf("Resultant Matrix:\n");
    for (i = 0; i < n; i++) {
        for (j = 0; j < n; j++) {
            printf("%.2f ", result[i][j]);
        }
        printf("\n");
    }

    return 0;
```

```
}
```

Exercise 2: String operations

```c
/* String operations: Concatenation, comparison, alphabetical order

 Written by Sophia Bano
 Date: 27/10/2023
*/

#include <stdio.h>
#include <string.h>

int main() {
    char str1[100], str2[100];
    printf("Enter the first string: ");
    fgets(str1, sizeof(str1), stdin);

    printf("Enter the second string: ");
    fgets(str2, sizeof(str2), stdin);

    // Removing newline character from fgets
    str1[strcspn(str1, "\n")] = 0;
    str2[strcspn(str2, "\n")] = 0;

    if (strcmp(str1, str2) == 0) {
        strcat(str1, str2);
        printf("Concatenated String: %s\n", str1);
    } else {
        printf("Strings in alphabetical order: ");
        if (strcmp(str1, str2) < 0) {
            printf("%s %s\n", str1, str2);
        } else {
            printf("%s %s\n", str2, str1);
        }
    }

    return 0;
}
```

Exercise 3: Word count

```c
/* Write a C program to count number of words

Written by Sophia Bano
Date: 27/10/2023
*/
```

```c
#include <stdio.h>
#include <string.h>

int countWords(char sentence[]) {
    int wordCount = 0;
    int length = strlen(sentence);
    int i;

    for (i = 0; i < length; i++) {
        if (sentence[i] == ' ') {  // check is space
            wordCount++;
        }
    }

    return wordCount + 1; // + 1 for last word
}

int main() {
    char sentence[100];
    int words;

    printf("Enter a sentence: ");
    fgets(sentence, sizeof(sentence), stdin);

    words = countWords(sentence);
    printf("The number of words in the sentence is: %d\n", words);

    return 0;
}
```

Exercise 4 and 5 solutions will be discussed during lab session 6 and will be released next week.