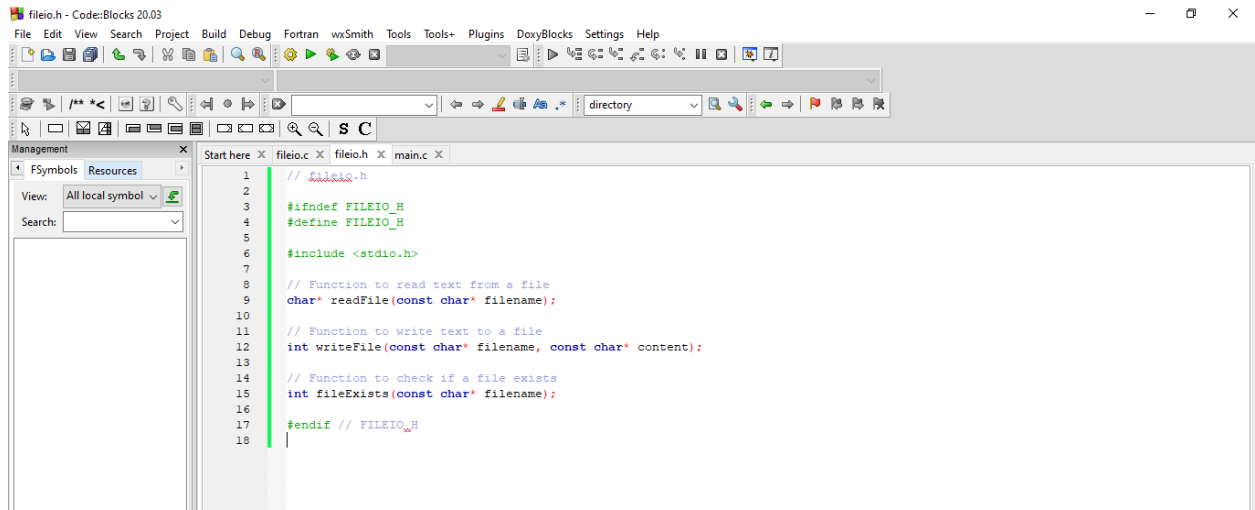


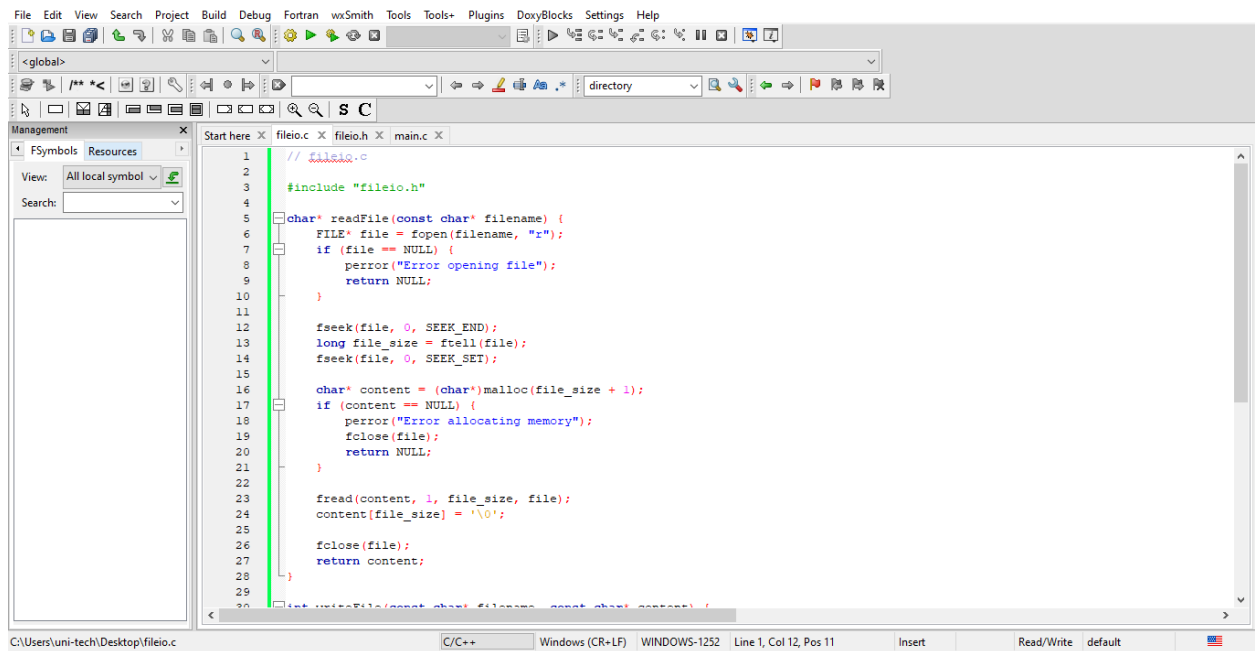
## LAB 6

Q1:



The screenshot shows the Code::Blocks 20.03 IDE with the fileio.h header file open. The left sidebar shows the 'Symbols' tab with 'All local symbol' selected. The main editor displays the following code:

```
1 // fileio.h
2
3 #ifndef FILEIO_H
4 #define FILEIO_H
5
6 #include <stdio.h>
7
8 // Function to read text from a file
9 char* readFile(const char* filename);
10
11 // Function to write text to a file
12 int writeFile(const char* filename, const char* content);
13
14 // Function to check if a file exists
15 int fileExists(const char* filename);
16
17 #endif // FILEIO_H
18
```



The screenshot shows the Code::Blocks 20.03 IDE with the fileio.c source file open. The left sidebar shows the 'Symbols' tab with 'All local symbol' selected. The main editor displays the following code:

```
1 // fileio.c
2
3 #include "fileio.h"
4
5 char* readFile(const char* filename) {
6     FILE* file = fopen(filename, "r");
7     if (file == NULL) {
8         perror("Error opening file");
9         return NULL;
10    }
11
12    fseek(file, 0, SEEK_END);
13    long file_size = ftell(file);
14    fseek(file, 0, SEEK_SET);
15
16    char* content = (char*)malloc(file_size + 1);
17    if (content == NULL) {
18        perror("Error allocating memory");
19        fclose(file);
20        return NULL;
21    }
22
23    fread(content, 1, file_size, file);
24    content[file_size] = '\0';
25
26    fclose(file);
27    return content;
28
29 }
30
31 int writeFile(const char* filename, const char* content) {
32
33 }
```

C:\Users\uni-tech\Desktop\fileio.c

C/C++

Windows (CR+LF)

WINDOWS-1252

Line 1, Col 12, Pos 11

Insert

Read/Write

default



fileio.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help

<global>

Management

FSymbols Resources

View: All local symbol

Search:

```
24 content[file_size] = '\0';
25
26 fclose(file);
27 return content;
28
29
30 int writeFile(const char* filename, const char* content) {
31     FILE* file = fopen(filename, "w");
32     if (file == NULL) {
33         perror("Error opening file");
34         return 0;
35     }
36
37     fputs(content, file);
38
39     fclose(file);
40     return 1;
41 }
42
43 int fileExists(const char* filename) {
44     FILE* file = fopen(filename, "r");
45     if (file != NULL) {
46         fclose(file);
47         return 1;
48     }
49     return 0;
50 }
51
```

main.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help

<global>

main():int

Management

FSymbols Resources

View: All local symbol

Search:

```
1 // main.c
2
3 #include <stdio.h>
4 #include "fileio.h"
5
6 int main() {
7     const char* filename = "example.txt";
8     const char* content = "Hello, File IO!";
9
10    // Write to file
11    if (writeFile(filename, content)) {
12        printf("Content successfully written to file.\n");
13    } else {
14        printf("Error writing to file.\n");
15        return 1;
16    }
17
18    // Read from file
19    char* readContent = readFile(filename);
20    if (readContent != NULL) {
21        printf("Content read from file: %s\n", readContent);
22        free(readContent);
23    } else {
24        printf("Error reading from file.\n");
25        return 1;
26    }
27
28    // Check file existence
29    if (fileExists(filename)) {
30        printf("File exists.\n");
31    }
32}
```

```
12 printf("Content successfully written to file.\n");
13 } else {
14     printf("Error writing to file.\n");
15     return 1;
16 }
17
18 // Read from file
19 char* readContent = readFile(filename);
20 if (readContent != NULL) {
21     printf("Content read from file: %s\n", readContent);
22     free(readContent);
23 } else {
24     printf("Error reading from file.\n");
25     return 1;
26 }
27
28 // Check file existence
29 if (fileExists(filename)) {
30     printf("File exists.\n");
31 } else {
32     printf("File does not exist.\n");
33 }
34
35 return 0;
36 }
37 gcc fileio.c main.c -o fileio_program
38 ./fileio_program
39
40
```

Q2:

```
1 // linked_list.h
2
3 #ifndef LINKED_LIST_H
4 #define LINKED_LIST_H
5
6 // Node structure for the linked list
7 struct Node {
8     int data;
9     struct Node* next;
10 };
11
12 // Function to create a new node with the given data
13 struct Node* createNode(int data);
14
15 // Function to insert a new node at the beginning of the linked list
16 struct Node* insertAtBeginning(struct Node* head, int data);
17
18 // Function to insert a new node at the end of the linked list
19 struct Node* insertAtEnd(struct Node* head, int data);
20
21 // Function to display the elements of the linked list
22 void displayList(struct Node* head);
23
24 // Function to free the memory allocated for the linked list
25 void freeList(struct Node* head);
26
27 #endif // LINKED_LIST_H
28
```

linked\_list.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global>

directory

Management

FSymbols Resources

View: All local symbol

Search:

```
1 // linked_list.c
2
3 #include "linked_list.h"
4 #include <stdio.h>
5 #include <stdlib.h>
6
7 struct Node* createNode(int data) {
8     struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
9     if (newNode == NULL) {
10         perror("Error creating node");
11         exit(EXIT_FAILURE);
12     }
13
14     newNode->data = data;
15     newNode->next = NULL;
16     return newNode;
17 }
18
19 struct Node* insertAtBeginning(struct Node* head, int data) {
20     struct Node* newNode = createNode(data);
21     newNode->next = head;
22     return newNode;
23 }
24
25 struct Node* insertAtEnd(struct Node* head, int data) {
26     struct Node* newNode = createNode(data);
27
28     if (head == NULL) {
29         return newNode;
30     }
```

C:\Users\uni-tech\Desktop\linked\_list.c

C/C++ Windows (CR+LF) WINDOWS-1252 Line 1, Col 4, Pos 3 Insert Read/Write default 18°C 1:04 AM 12/13/2023

linked\_list.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global>

directory

Management

FSymbols Resources

View: All local symbol

Search:

```
30 }
31
32 struct Node* current = head;
33 while (current->next != NULL) {
34     current = current->next;
35 }
36
37 current->next = newNode;
38 return head;
39 }
40
41 void displayList(struct Node* head) {
42     struct Node* current = head;
43     while (current != NULL) {
44         printf("%d -> ", current->data);
45         current = current->next;
46     }
47     printf("NULL\n");
48 }
49
50 void freeList(struct Node* head) {
51     struct Node* current = head;
52     while (current != NULL) {
53         struct Node* nextNode = current->next;
54         free(current);
55         current = nextNode;
56     }
57 }
58 }
```

C:\Users\uni-tech\Desktop\linked\_list.c

C/C++ Windows (CR+LF) WINDOWS-1252 Line 2, Col 1, Pos 18 Insert Read/Write default 18°C 1:04 AM 12/13/2023

```
1 // main.c
2 #include "linked_list.h"
3 int main() {
4     struct Node* list = NULL;
5
6     // Insert elements at the beginning
7     list = insertAtBeginning(list, 10);
8     list = insertAtBeginning(list, 20);
9     list = insertAtBeginning(list, 30);
10
11     // Display the linked list
12     printf("Linked List after insertions at the beginning:\n");
13     displayList(list);
14
15     // Insert elements at the end
16     list = insertAtEnd(list, 40);
17     list = insertAtEnd(list, 50);
18
19     // Display the linked list
20     printf("Linked List after insertions at the end:\n");
21     displayList(list);
22
23     // Free the memory allocated for the linked list
24     freeList(list);
25
26     return 0;
27 }
28 gcc linked_list.c main.c -o linked_list_program
29 ./linked_list_program
```

Q3:

```
1 // matrix_operations.h
2
3 #ifndef MATRIX_OPERATIONS_H
4 #define MATRIX_OPERATIONS_H
5
6 // Structure to represent a matrix
7 typedef struct {
8     int rows;
9     int cols;
10    double** data;
11 } Matrix;
12
13 // Function to allocate memory for a matrix
14 Matrix createMatrix(int rows, int cols);
15
16 // Function to free the memory allocated for a matrix
17 void freeMatrix(Matrix* matrix);
18
19 // Function to add two matrices
20 Matrix addMatrices(Matrix matrix1, Matrix matrix2);
21
22 // Function to multiply two matrices
23 Matrix multiplyMatrices(Matrix matrix1, Matrix matrix2);
24
25 // Function to transpose a matrix
26 Matrix transposeMatrix(Matrix matrix);
27
28 // Function to calculate the determinant of a matrix
29 double determinant(Matrix matrix);
30
```

matrix\_operations.h - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help

directory

Management

FSymbols Resources

View: All local symbol

Search:

```
8 int rows;
9 int cols;
10 double** data;
11 } Matrix;
12
13 // Function to allocate memory for a matrix
14 Matrix createMatrix(int rows, int cols);
15
16 // Function to free the memory allocated for a matrix
17 void freeMatrix(Matrix* matrix);
18
19 // Function to add two matrices
20 Matrix addMatrices(Matrix matrix1, Matrix matrix2);
21
22 // Function to multiply two matrices
23 Matrix multiplyMatrices(Matrix matrix1, Matrix matrix2);
24
25 // Function to transpose a matrix
26 Matrix transposeMatrix(Matrix matrix);
27
28 // Function to calculate the determinant of a matrix
29 double determinant(Matrix matrix);
30
31 // Function to display a matrix
32 void displayMatrix(Matrix matrix);
33
34 #endif // MATRIX_OPERATIONS_H
35
36
```

C:\Users\uni-tech\Desktop\matrix\_operations.h C/C++ Windows (CR+LF) WINDOWS-1252 Line 36, Col 1, Pos 842 Insert Read/Write default 1:12 AM 12/13/2023

matrix\_operations.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help

directory

Management

FSymbols Resources

View: All local symbol

Search:

```
1 // matrix_operations.c
2
3 #include "matrix_operations.h"
4 #include <stdio.h>
5 #include <stdlib.h>
6
7 Matrix createMatrix(int rows, int cols) {
8     Matrix matrix;
9     matrix.rows = rows;
10    matrix.cols = cols;
11
12    // Allocate memory for the matrix
13    matrix.data = (double**)malloc(rows * sizeof(double*));
14    if (matrix.data == NULL) {
15        perror("Error allocating memory for matrix");
16        exit(EXIT_FAILURE);
17    }
18
19    for (int i = 0; i < rows; i++) {
20        matrix.data[i] = (double*)malloc(cols * sizeof(double));
21        if (matrix.data[i] == NULL) {
22            perror("Error allocating memory for matrix");
23            exit(EXIT_FAILURE);
24        }
25    }
26
27    return matrix;
28 }
29
30 void freeMatrix(Matrix* matrix) {
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```

matrix\_operations.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global> multiplyMatrices(Matrix matrix1, Matrix matrix2): Matrix

directory

Management

View: All local symbol

Search:

```
29 void freeMatrix(Matrix* matrix) {
30     for (int i = 0; i < matrix->rows; i++) {
31         free(matrix->data[i]);
32     }
33     free(matrix->data);
34 }
35
36
37 Matrix addMatrices(Matrix matrix1, Matrix matrix2) {
38     if (matrix1.rows != matrix2.rows || matrix1.cols != matrix2.cols) {
39         fprintf(stderr, "Error: Matrices must have the same dimensions for addition.\n");
40         exit(EXIT_FAILURE);
41     }
42
43     Matrix result = createMatrix(matrix1.rows, matrix1.cols);
44
45     for (int i = 0; i < matrix1.rows; i++) {
46         for (int j = 0; j < matrix1.cols; j++) {
47             result.data[i][j] = matrix1.data[i][j] + matrix2.data[i][j];
48         }
49     }
50
51     return result;
52 }
53
54 Matrix multiplyMatrices(Matrix matrix1, Matrix matrix2) {
55     if (matrix1.cols != matrix2.rows) {
56         fprintf(stderr, "Error: Number of columns in the first matrix must be equal to the number of rows in the second matrix for\n");
57         exit(EXIT_FAILURE);
58     }
59 }
```

C:\Users\uni-tech\Desktop\matrix\_operations.c C/C++ Windows (CR+LF) WINDOWS-1252 Line 55, Col 31, Pos 1496 Insert Read/Write default 18°C 1:12 AM 12/13/2023

matrix\_operations.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global> multiplyMatrices(Matrix matrix1, Matrix matrix2): Matrix

directory

Management

View: All local symbol

Search:

```
57     exit(EXIT_FAILURE);
58 }
59
60 Matrix result = createMatrix(matrix1.rows, matrix2.cols);
61
62 for (int i = 0; i < matrix1.rows; i++) {
63     for (int j = 0; j < matrix2.cols; j++) {
64         result.data[i][j] = 0;
65         for (int k = 0; k < matrix1.cols; k++) {
66             result.data[i][j] += matrix1.data[i][k] * matrix2.data[k][j];
67         }
68     }
69 }
70
71 return result;
72 }
73
74 Matrix transposeMatrix(Matrix matrix) {
75     Matrix result = createMatrix(matrix.cols, matrix.rows);
76
77     for (int i = 0; i < matrix.rows; i++) {
78         for (int j = 0; j < matrix.cols; j++) {
79             result.data[j][i] = matrix.data[i][j];
80         }
81     }
82
83     return result;
84 }
85
86 double determinant(Matrix matrix) {
87 }
```

C:\Users\uni-tech\Desktop\matrix\_operations.c C/C++ Windows (CR+LF) WINDOWS-1252 Line 59, Col 1, Pos 1696 Insert Read/Write default 18°C 1:12 AM 12/13/2023

matrix\_operations.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global>

directory

Management

View: All local symbol

Search:

```
74 Matrix transposeMatrix(Matrix matrix) {
75     Matrix result = createMatrix(matrix.cols, matrix.rows);
76
77     for (int i = 0; i < matrix.rows; i++) {
78         for (int j = 0; j < matrix.cols; j++) {
79             result.data[j][i] = matrix.data[i][j];
80         }
81     }
82
83     return result;
84 }
85
86 double determinant(Matrix matrix) {
87     // Function to calculate the determinant can be implemented here
88     // (This implementation is not provided for brevity)
89     fprintf(stderr, "Error: Determinant calculation not implemented.\n");
90     exit(EXIT_FAILURE);
91 }
92
93 void displayMatrix(Matrix matrix) {
94     for (int i = 0; i < matrix.rows; i++) {
95         for (int j = 0; j < matrix.cols; j++) {
96             printf("%f\t", matrix.data[i][j]);
97         }
98         printf("\n");
99     }
100     printf("\n");
101 }
102 }
```

C:\Users\uni-tech\Desktop\matrix\_operations.c C/C++ Windows (CR+LF) WINDOWS-1252 Line 102, Col 1, Pos 2895 Insert Read/Write default 1:13 AM 12/13/2023

main.c - Code::Blocks 20.03

File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoryBlocks Settings Help

<global>

directory

Management

View: All local symbol

Search:

```
1 // main.c
2
3 #include "matrix_operations.h"
4
5 int main() {
6     Matrix matrix1 = createMatrix(2, 3);
7     matrix1.data[0][0] = 1;
8     matrix1.data[0][1] = 2;
9     matrix1.data[0][2] = 3;
10    matrix1.data[1][0] = 4;
11    matrix1.data[1][1] = 5;
12    matrix1.data[1][2] = 6;
13
14    Matrix matrix2 = createMatrix(3, 2);
15    matrix2.data[0][0] = 7;
16    matrix2.data[0][1] = 8;
17    matrix2.data[1][0] = 9;
18    matrix2.data[1][1] = 10;
19    matrix2.data[2][0] = 11;
20    matrix2.data[2][1] = 12;
21
22    printf("Matrix 1:\n");
23    displayMatrix(matrix1);
24
25    printf("Matrix 2:\n");
26    displayMatrix(matrix2);
27
28    Matrix sum = addMatrices(matrix1, matrix2);
29    printf("Matrix Sum (Matrix1 + Matrix2):\n");
30    displayMatrix(sum);
31 }
```

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