COMSATS UNIVERSITY ISLAMABAD

ATTOCK CAMPUS

DEPARTMENT OF COMPUTER SCIENCE

PROGRAM BS-SE

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REG. NO: **SP23-BSE-067**

SUBJECT: **DS**

ASSIG. NO: **01**

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Introduction

This program implements a simple task management system using a singly linked list. Each task contains a unique ID, description, and priority. The system provides functionalities to add tasks in priority order, remove tasks by priority or ID, and view all tasks. The functionalities are discussed below:

1. **Create Task**
2. **Add Task**
3. **Remove Highest Priority Task**
4. **Remove Task By ID**
5. **View task**

Single linked list

A data structure known as a single linked list is made up of a series of components known as nodes, each of which consists of two parts:

Data:

The actual information or value that is kept on file in the node.

Pointer:

A pointer, or reference, to the following node in the series.
The head, is where the list begins. The list's end is indicated by the last node, which points to nullptr.

Explanation of tasks/code:

1. **Structure:**

Three important kinds of data are present in a node:

- **Task ID:** An integer that serves as the task's unique identification.
- **Task Description:** A text that offers specifics about the assignment.
- **Priority:** An integer value indicating the task's importance (greater values correspond to higher priority).
- To create the linked structure, every task node additionally has a reference to the node after it in the list.

2. **Adding a Task Based on Priority**

When a new task is added, it must be inserted into the list in a way that maintains the priority order. The list is traversed to find the correct position for the new task:

- If the list is empty, the new task becomes the “head” (start) of the list.

- If the new task has a higher priority than the current first task, it is inserted at the “beginning” of the list, becoming the new head.
- If the task has a lower priority, the program traverses the list to find the appropriate position. The traversal continues until the new task’s priority is higher than the task at the current position, and it is inserted in the correct spot to maintain the priority order.

3. Examining Each Task

The list is scanned from head to tail in order to show every task in the system. For every list node:

- The task is printed along with its ID, description, and priority.
- Once there are no more jobs to display, the traversal continues until the end of the list.

4. Taking Out the Highest Priority Task

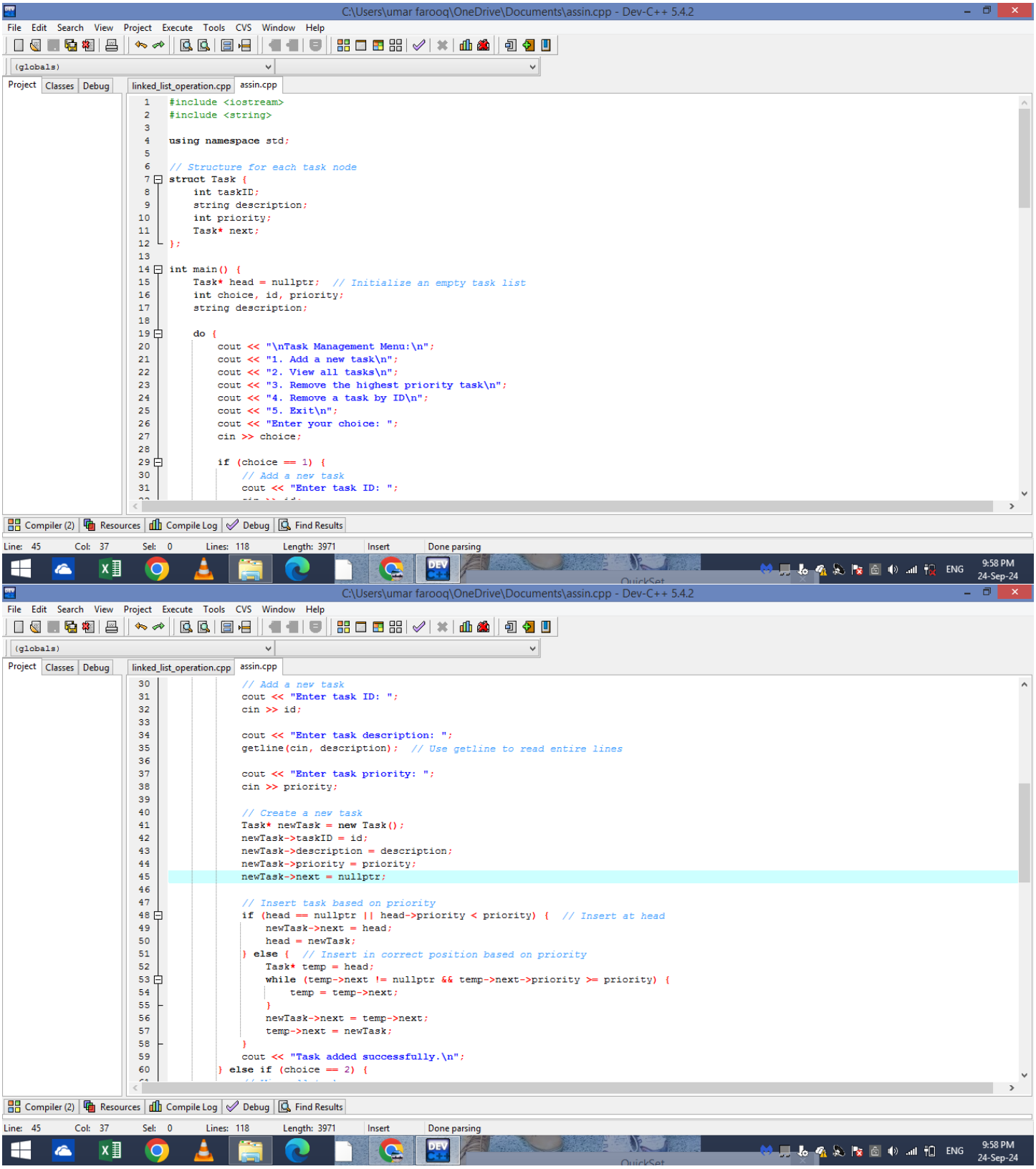
When a task system is prioritized, the task with the highest priority is always at the top of the list. To make this task disappear:

- Efficiently "skipping over" and eliminating the first task, the head pointer is modified to point to the next node in the list.
- Memory leaks are avoided by freeing up the memory allotted to the deleted task. The highest-priority item is always at the top of the list, making it simple to eliminate, which makes this procedure efficient.

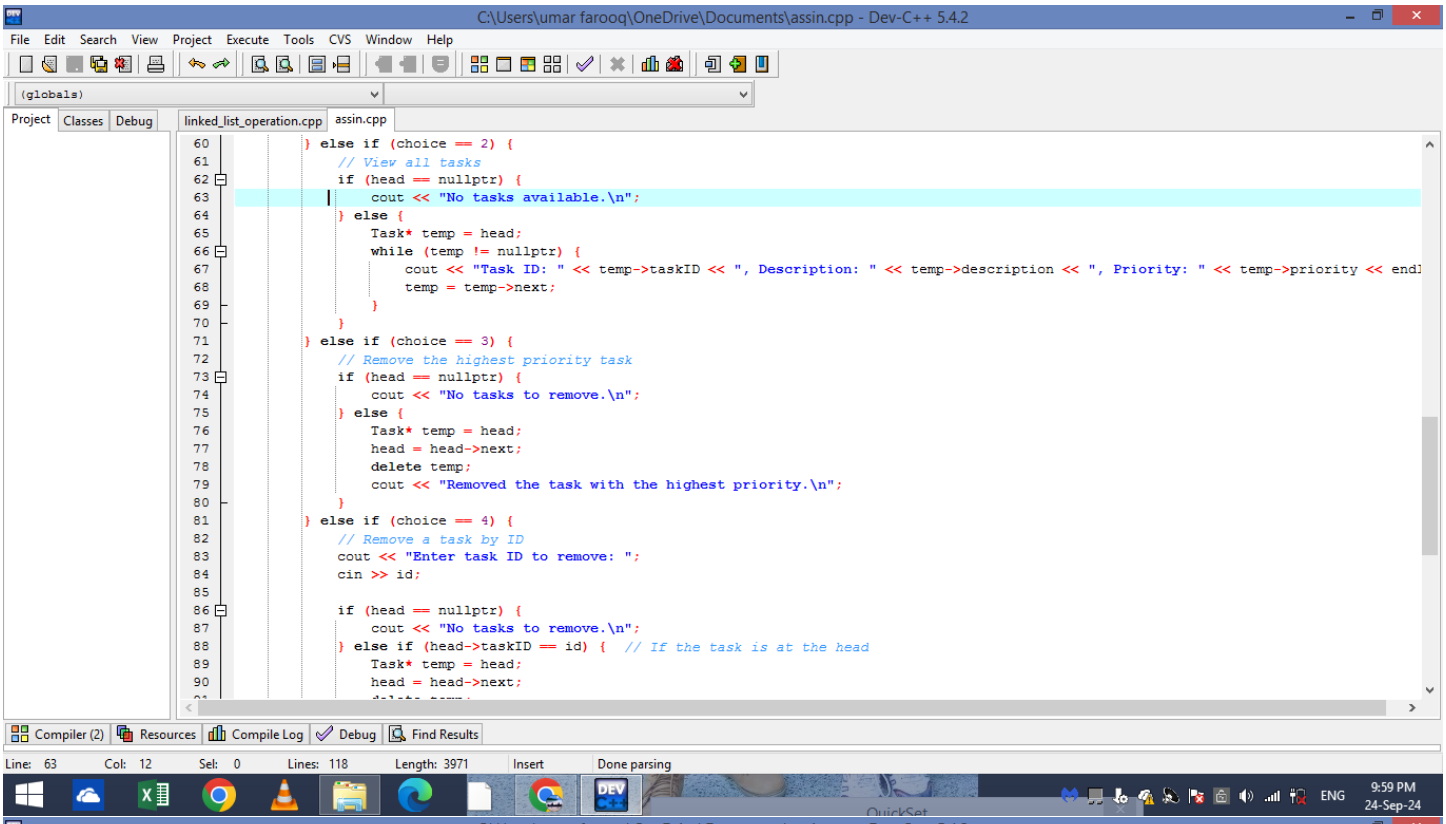
5. Removing a Task by ID

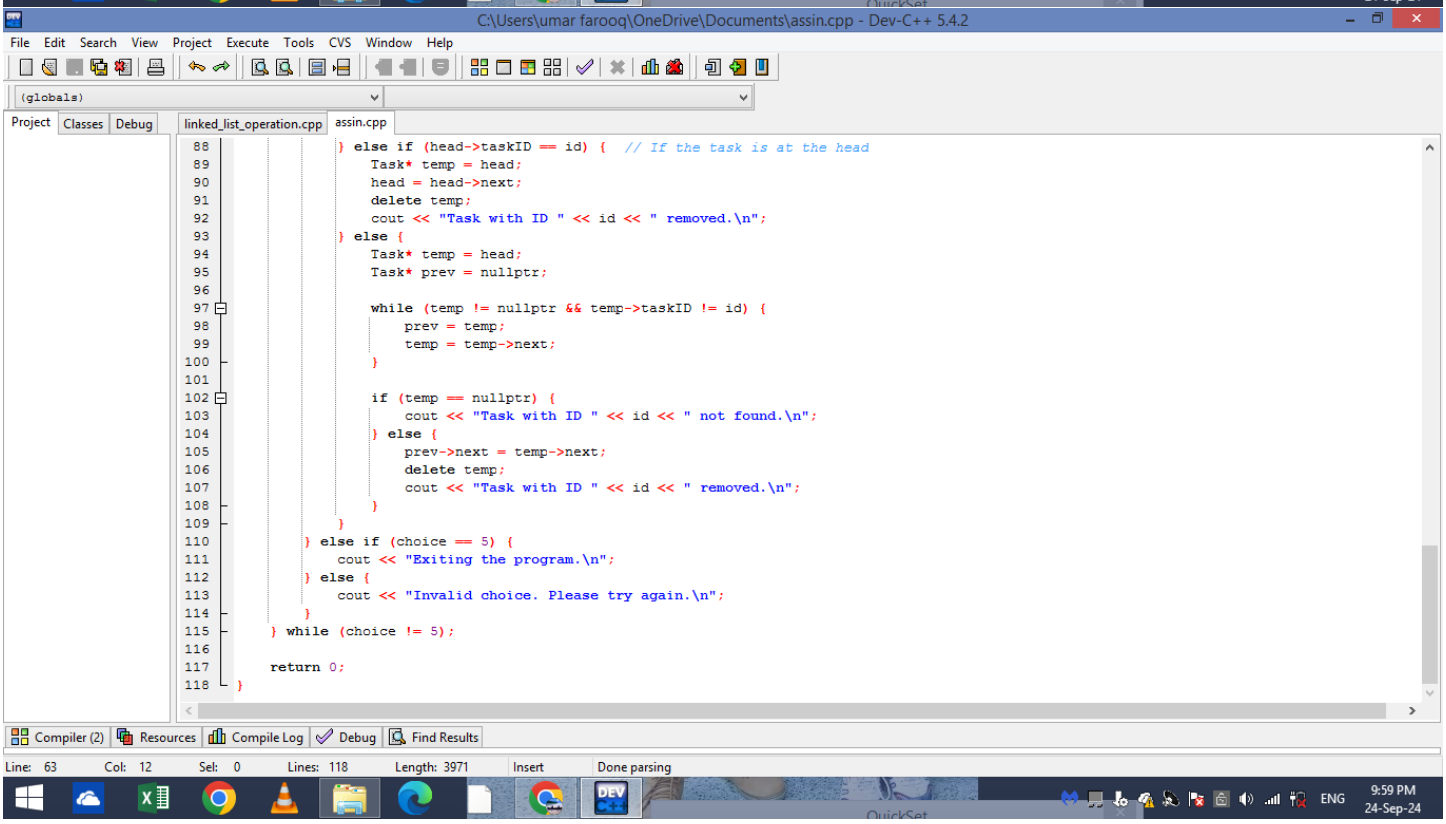
To remove a specific task by its unique ID, the list is traversed from the head:

- The program checks each node's task ID until it finds the one that matches the user’s input.
- If the task is found at the head, it is removed just like the highest-priority task.
- If the task is found elsewhere in the list, the program adjusts the pointers of the surrounding nodes to "skip over" the task, effectively removing it.
- If the task with the given ID is not found, an appropriate message is displayed to indicate that the task does not exist.

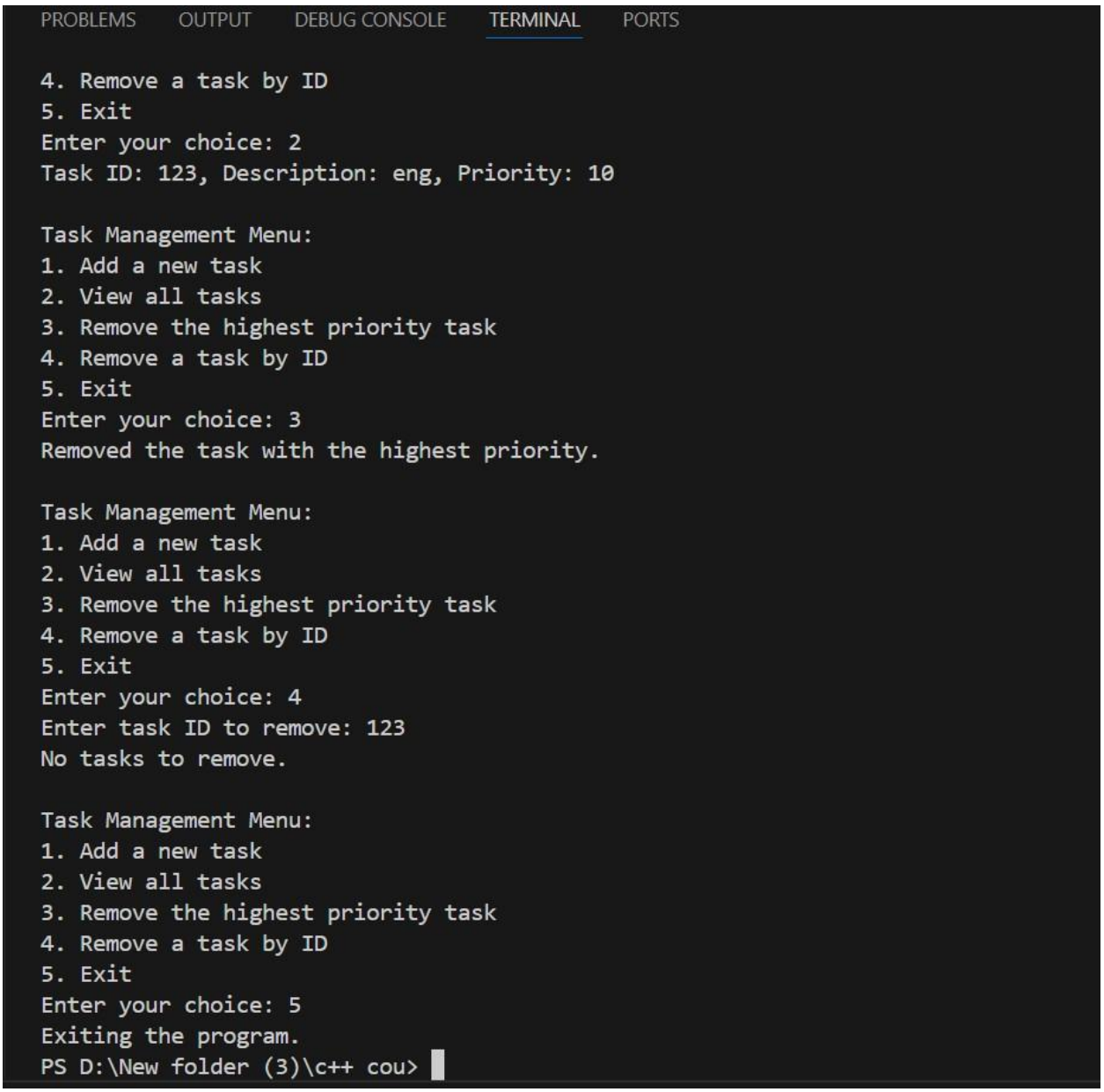

C:\Users\umar farooq\OneDrive\Documents\assin.cpp - Dev-C++ 5.4.2
File Edit Search View Project Execute Tools CVS Window Help
(globals)
Project Classes Debug
linked_list_operation.cpp assin.cpp
#include <iostream>
#include <string>
using namespace std;
// Structure for each task node
struct Task {
int taskID;
string description;
int priority;
Task* next;
};
int main() {
Task* head = nullptr; // Initialize an empty task list
int choice, id, priority;
string description;
do {
cout << "\nTask Management Menu:\n";
cout << "1. Add a new task\n";
cout << "2. View all tasks\n";
cout << "3. Remove the highest priority task\n";
cout << "4. Remove a task by ID\n";
cout << "5. Exit\n";
cout << "Enter your choice: ";
cin >> choice;
if (choice == 1) {
// Add a new task
cout << "Enter task ID: ";
Compiler (2) Resources Compile Log Debug Find Results
Line: 45 Col: 37 Sel: 0 Lines: 118 Length: 3971 Insert Done parsing
ENG 9:58 PM 24-Sep-24

C:\Users\umar farooq\OneDrive\Documents\assin.cpp - Dev-C++ 5.4.2
File Edit Search View Project Execute Tools CVS Window Help
(globals)
Project Classes Debug
linked_list_operation.cpp assin.cpp
// Add a new task
cout << "Enter task ID: ";
cin >> id;
cout << "Enter task description: ";
getline(cin, description); // Use getline to read entire lines
cout << "Enter task priority: ";
cin >> priority;
// Create a new task
Task* newTask = new Task();
newTask->taskID = id;
newTask->description = description;
newTask->priority = priority;
newTask->next = nullptr;
// Insert task based on priority
if (head == nullptr || head->priority < priority) { // Insert at head
newTask->next = head;
head = newTask;
} else { // Insert in correct position based on priority
Task* temp = head;
while (temp->next != nullptr && temp->next->priority >= priority) {
temp = temp->next;
}
newTask->next = temp->next;
temp->next = newTask;
}
cout << "Task added successfully.\n";
} else if (choice == 2) {
Compiler (2) Resources Compile Log Debug Find Results
Line: 45 Col: 37 Sel: 0 Lines: 118 Length: 3971 Insert Done parsing
ENG 9:58 PM 24-Sep-24


C:\Users\umar farooq\OneDrive\Documents\assin.cpp - Dev-C++ 5.4.2
File Edit Search View Project Execute Tools CVS Window Help
(globals)
Project Classes Debug
linked_list_operation.cpp assin.cpp
} else if (choice == 2) {
// View all tasks
if (head == nullptr) {
cout << "No tasks available.\n";
} else {
Task* temp = head;
while (temp != nullptr) {
cout << "Task ID: " << temp->taskID << ", Description: " << temp->description << ", Priority: " << temp->priority << endl
temp = temp->next;
}
}
} else if (choice == 3) {
// Remove the highest priority task
if (head == nullptr) {
cout << "No tasks to remove.\n";
} else {
Task* temp = head;
head = head->next;
delete temp;
cout << "Removed the task with the highest priority.\n";
}
} else if (choice == 4) {
// Remove a task by ID
cout << "Enter task ID to remove: ";
cin >> id;
if (head == nullptr) {
cout << "No tasks to remove.\n";
} else if (head->taskID == id) { // If the task is at the head
Task* temp = head;
head = head->next;
Compiler (2) Resources Compile Log Debug Find Results
Line: 63 Col: 12 Sel: 0 Lines: 118 Length: 3971 Insert Done parsing
ENG 9:59 PM 24-Sep-24


C:\Users\umar farooq\OneDrive\Documents\assin.cpp - Dev-C++ 5.4.2
File Edit Search View Project Execute Tools CVS Window Help
(globals)
Project Classes Debug
linked_list_operation.cpp assin.cpp
} else if (head->taskID == id) { // If the task is at the head
Task* temp = head;
head = head->next;
delete temp;
cout << "Task with ID " << id << " removed.\n";
} else {
Task* temp = head;
Task* prev = nullptr;
while (temp != nullptr && temp->taskID != id) {
prev = temp;
temp = temp->next;
}
if (temp == nullptr) {
cout << "Task with ID " << id << " not found.\n";
} else {
prev->next = temp->next;
delete temp;
cout << "Task with ID " << id << " removed.\n";
}
}
} else if (choice == 5) {
cout << "Exiting the program.\n";
} else {
cout << "Invalid choice. Please try again.\n";
}
} while (choice != 5);
return 0;
}
Compiler (2) Resources Compile Log Debug Find Results
Line: 63 Col: 12 Sel: 0 Lines: 118 Length: 3971 Insert Done parsing
ENG 9:59 PM 24-Sep-24

Output


PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
4. Remove a task by ID
5. Exit
Enter your choice: 2
Task ID: 123, Description: eng, Priority: 10
Task Management Menu:
1. Add a new task
2. View all tasks
3. Remove the highest priority task
4. Remove a task by ID
5. Exit
Enter your choice: 3
Removed the task with the highest priority.
Task Management Menu:
1. Add a new task
2. View all tasks
3. Remove the highest priority task
4. Remove a task by ID
5. Exit
Enter your choice: 4
Enter task ID to remove: 123
No tasks to remove.
Task Management Menu:
1. Add a new task
2. View all tasks
3. Remove the highest priority task
4. Remove a task by ID
5. Exit
Enter your choice: 5
Exiting the program.
PS D:\New folder (3)\c++ cou>