Program 7

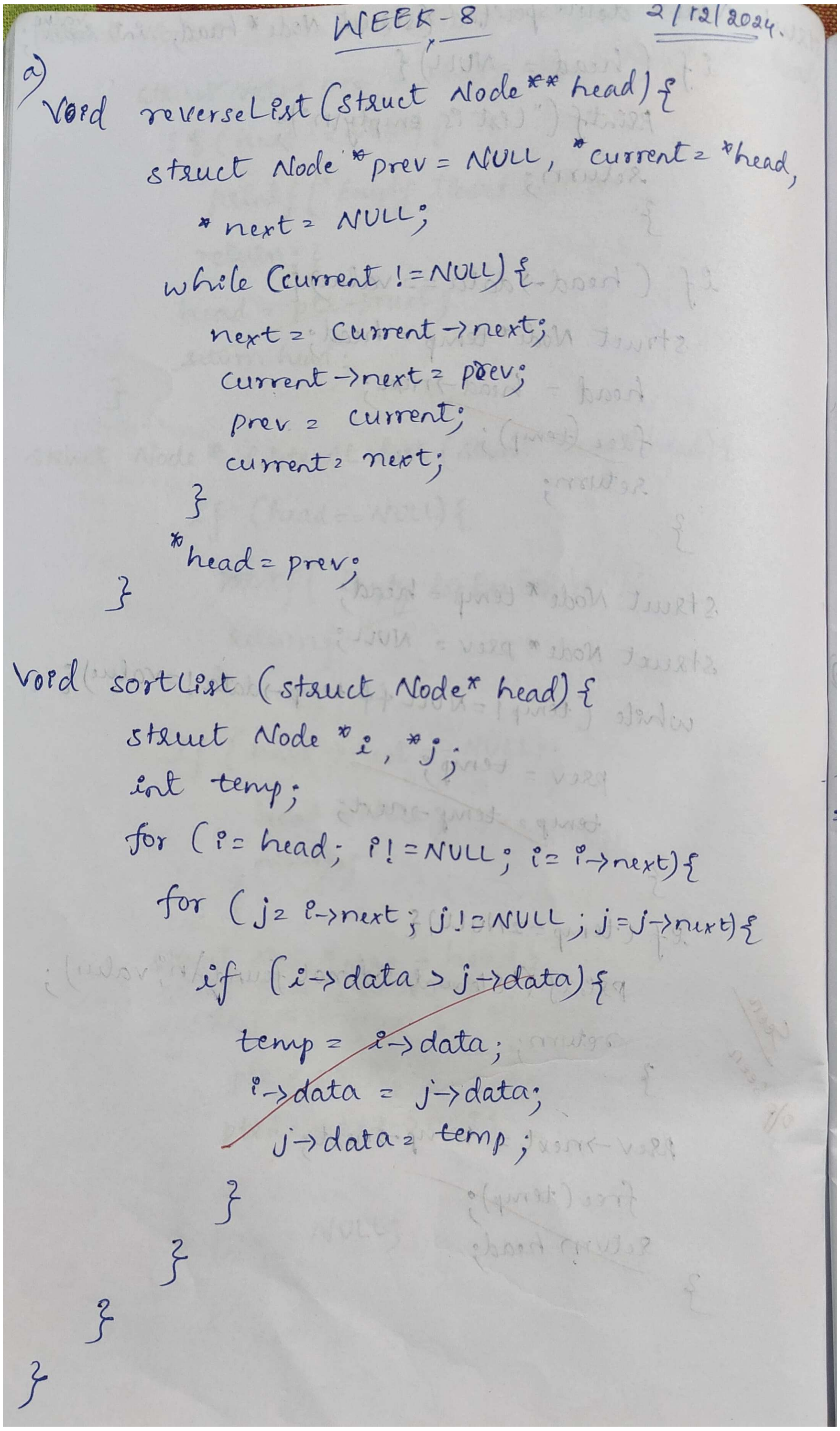
a) Write a Program to Implement Single Link List with following operations:

(i)Sort the linked list,

(ii) Reverse the linked list,

(iii)Concatenation of two linked lists.

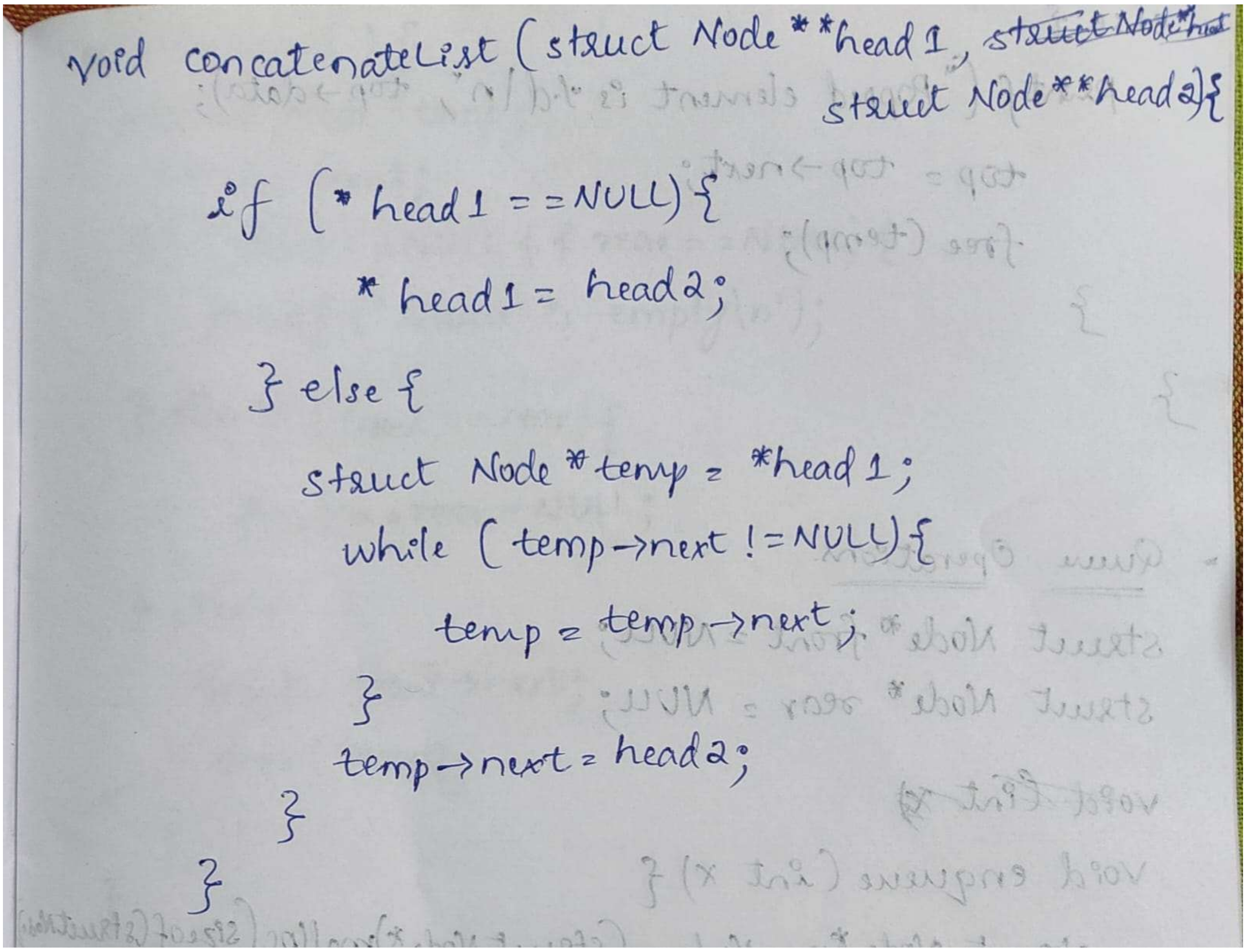
Observation:



WEEK-8   2/12/2024.

a)

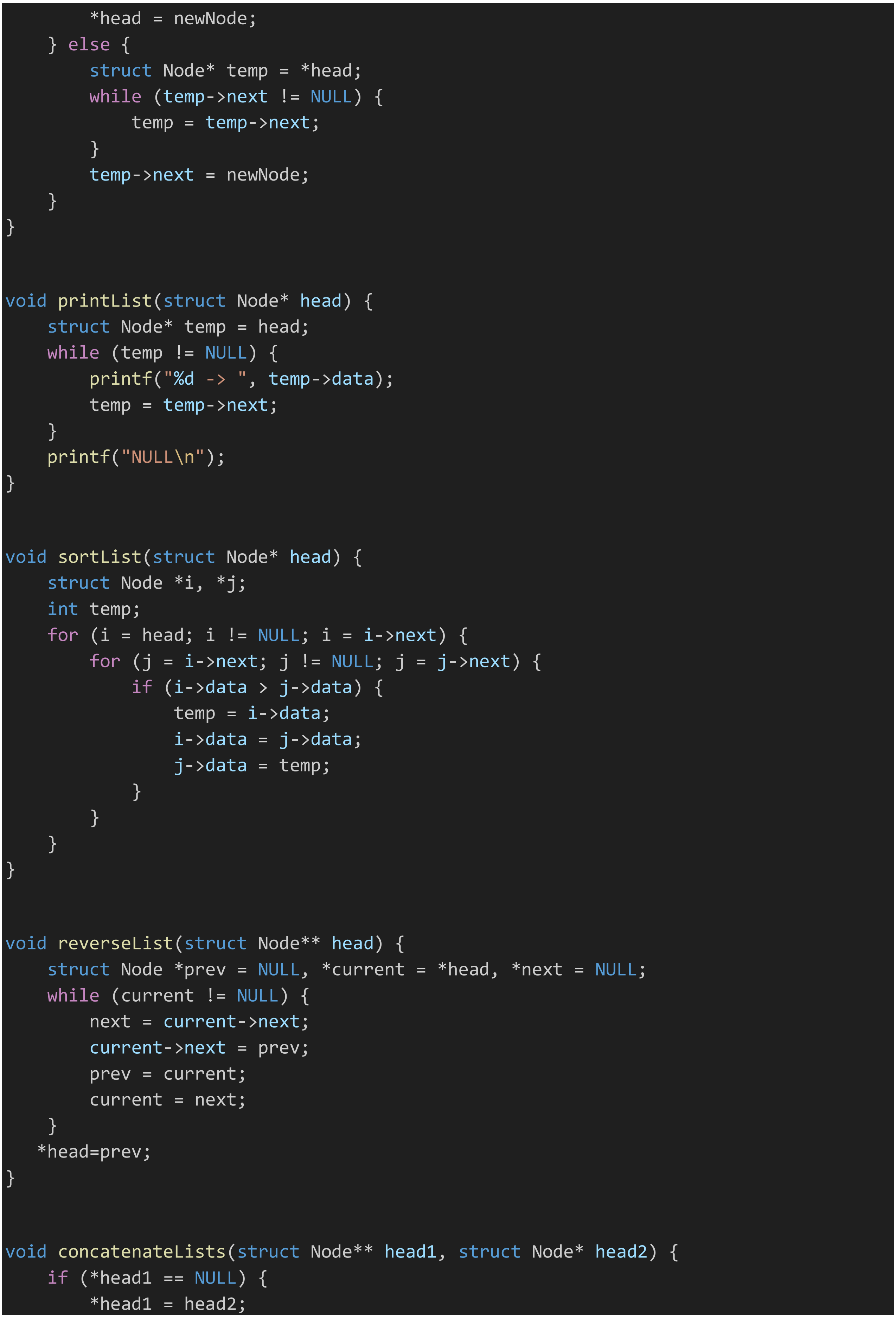
```
void reverseList(struct Node** head){
    struct Node *prev = NULL, *current = *head,
        * next = NULL;
    while (current != NULL) {
        next = current->next;
        current->next = prev;
        prev = current;
        current = next;
    }
    *head = prev;
}

void sortList (struct Node* head){
    struct Node *i, *j;
    int temp;
    for (i= head; i!=NULL; i= i->next){
        for (j= i->next; j!=NULL; j=j->next){
            if (i->data > j->data){
                temp = i->data;
                i->data = j->data;
                j->data = temp;
            }
        }
    }
}
```



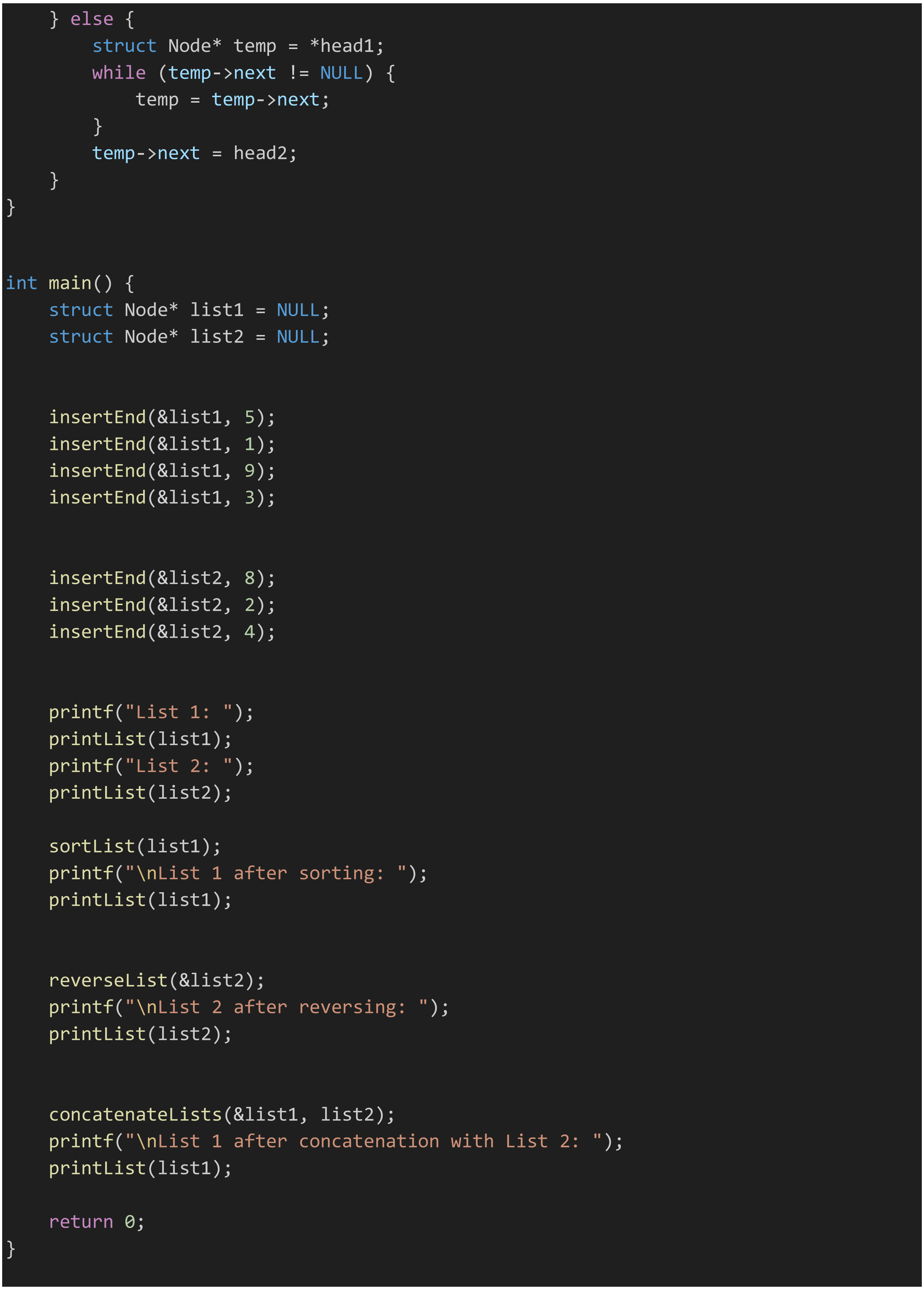
```
void concatenateList(struct Node **head1, ~~struct Node*head~~
                                          struct Node**head2){

    if (*head1 ==NULL){
        *head1= head2;
    } else {
        struct Node *temp = *head1;
        while (temp->next !=NULL){
            temp = temp->next;
        }
        temp->next = head2;
    }
}
```

Code:

```
 #include <stdio.h>
#include <stdlib.h>


struct Node {
    int data;
    struct Node* next;
};


struct Node* createNode(int data) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = data;
    newNode->next = NULL;
    return newNode;
}


void insertEnd(struct Node** head, int data) {
    struct Node* newNode = createNode(data);
    if (*head == NULL) {
```

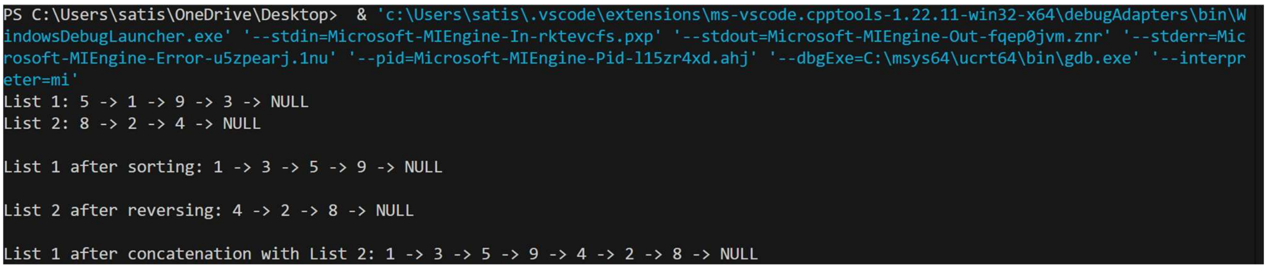


```
        *head = newNode;
    } else {
        struct Node* temp = *head;
        while (temp->next != NULL) {
            temp = temp->next;
        }
        temp->next = newNode;
    }
}


void printList(struct Node* head) {
    struct Node* temp = head;
    while (temp != NULL) {
        printf("%d -> ", temp->data);
        temp = temp->next;
    }
    printf("NULL\n");
}


void sortList(struct Node* head) {
    struct Node *i, *j;
    int temp;
    for (i = head; i != NULL; i = i->next) {
        for (j = i->next; j != NULL; j = j->next) {
            if (i->data > j->data) {
                temp = i->data;
                i->data = j->data;
                j->data = temp;
            }
        }
    }
}


void reverseList(struct Node** head) {
    struct Node *prev = NULL, *current = *head, *next = NULL;
    while (current != NULL) {
        next = current->next;
        current->next = prev;
        prev = current;
        current = next;
    }
   *head=prev;
}


void concatenateLists(struct Node** head1, struct Node* head2) {
    if (*head1 == NULL) {
        *head1 = head2;
```



```c
    } else {
        struct Node* temp = *head1;
        while (temp->next != NULL) {
            temp = temp->next;
        }
        temp->next = head2;
    }
}


int main() {
    struct Node* list1 = NULL;
    struct Node* list2 = NULL;


    insertEnd(&list1, 5);
    insertEnd(&list1, 1);
    insertEnd(&list1, 9);
    insertEnd(&list1, 3);


    insertEnd(&list2, 8);
    insertEnd(&list2, 2);
    insertEnd(&list2, 4);


    printf("List 1: ");
    printList(list1);
    printf("List 2: ");
    printList(list2);

    sortList(list1);
    printf("\nList 1 after sorting: ");
    printList(list1);


    reverseList(&list2);
    printf("\nList 2 after reversing: ");
    printList(list2);


    concatenateLists(&list1, list2);
    printf("\nList 1 after concatenation with List 2: ");
    printList(list1);

    return 0;
}
```

Output:

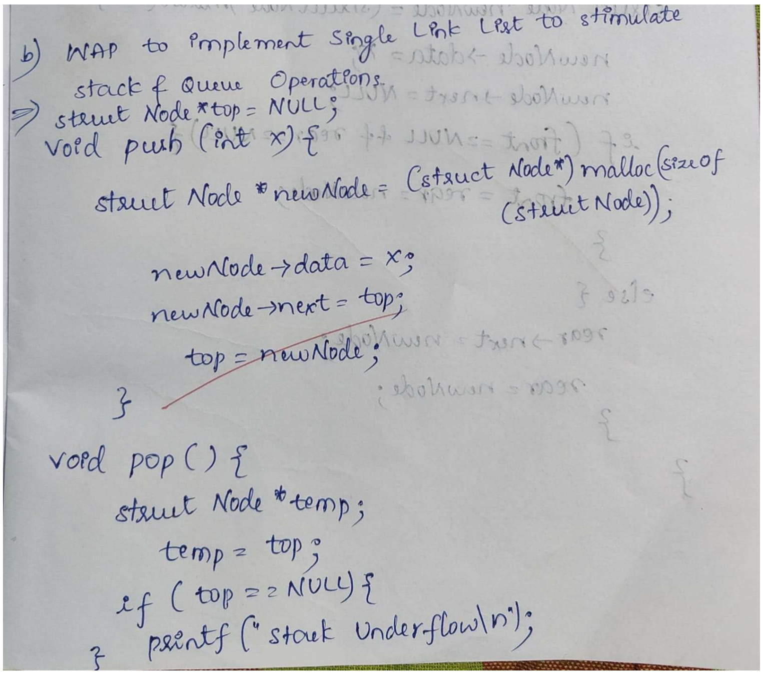


```
PS C:\Users\satis\OneDrive\Desktop>  & 'c:\Users\satis\.vscode\extensions\ms-vscode.cpptools-1.22.11-win32-x64\debugAdapters\bin\WindowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-rktevcfs.pxp' '--stdout=Microsoft-MIEngine-Out-fqep0jvm.znr' '--stderr=Microsoft-MIEngine-Error-u5zpearj.1nu' '--pid=Microsoft-MIEngine-Pid-l15zr4xd.ahj' '--dbgExe=C:\msys64\ucrt64\bin\gdb.exe' '--interpreter=mi'
List 1: 5 -> 1 -> 9 -> 3 -> NULL
List 2: 8 -> 2 -> 4 -> NULL

List 1 after sorting: 1 -> 3 -> 5 -> 9 -> NULL

List 2 after reversing: 4 -> 2 -> 8 -> NULL

List 1 after concatenation with List 2: 1 -> 3 -> 5 -> 9 -> 4 -> 2 -> 8 -> NULL
```

b)Write a Program to Implement Single Link List to simulate

(i)Stack
(ii)Queue Operations.

Observation:

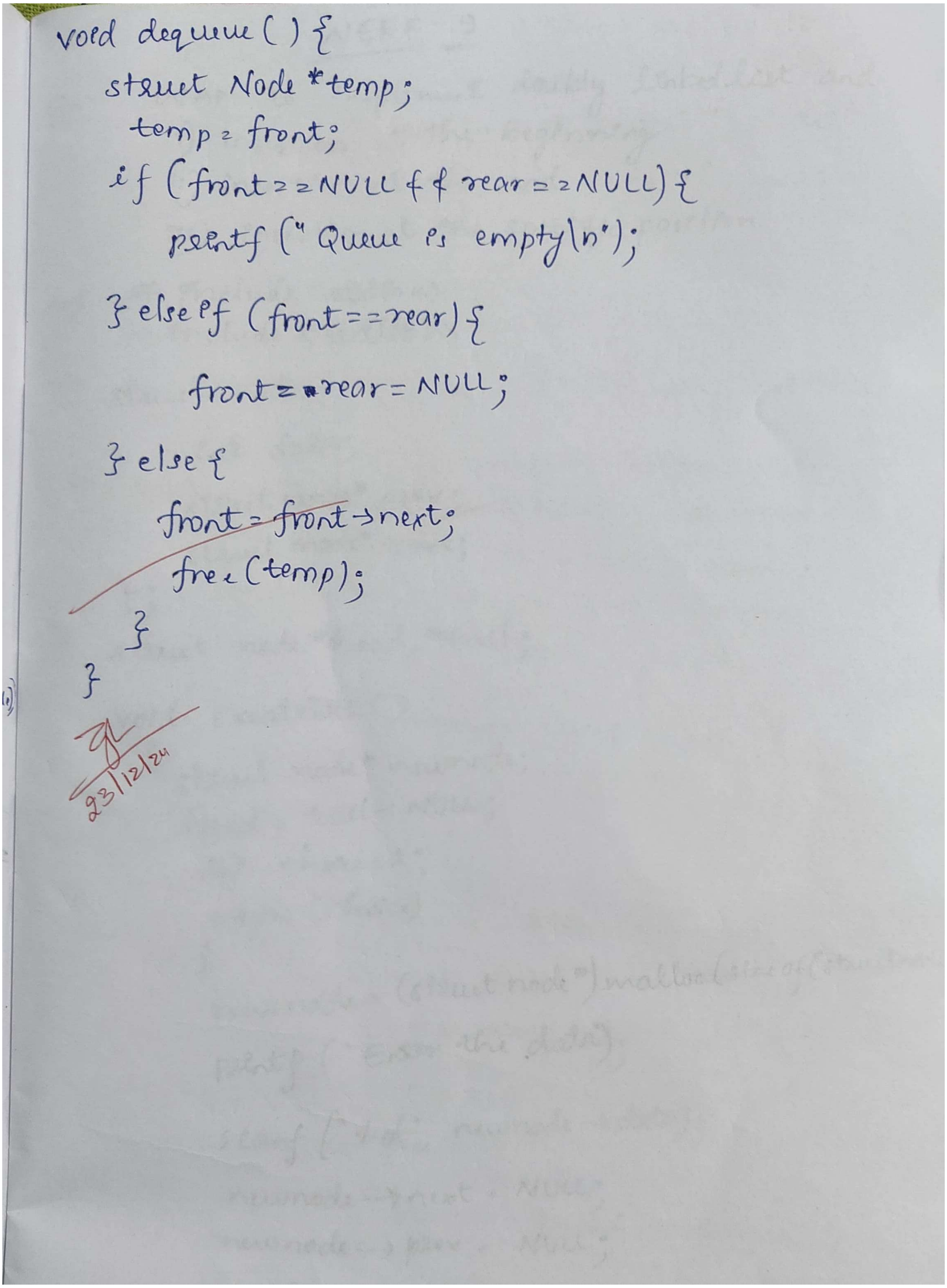


b) WAP to implement Single Link List to stimulate
stack & Queue Operations.

```
=> struct Node *top = NULL;
void push (int x) {

    struct Node *newNode = (struct Node*) malloc (sizeof
                                        (struct Node));

        newNode->data = x;
        newNode->next = top;
            top = newNode;
    }

void pop () {
    struct Node *temp;
        temp = top;
    if ( top == NULL) {
        printf (" stack Underflow\n");
    }
else {
    printf ("Popped element is %d\n", top->data);
        top = top->next;
        free (temp);
    }
}
```

- Queue Operations

```
struct Node* front = NULL;
struct Node* rear = NULL;

~~void Lint~~

void enqueue (int x) {
   struct Node *newNode = (struct Node *)malloc(sizeof(struct
       newNode ->data = x;
       newNode ->next = NULL;
   if (front == NULL && rear == NULL) {
         front = rear = newNode;
       }
   else {
       rear->next = newNode;
        rear = newNode;
      }
}
```



```
void dequeue() {
   struct Node *temp;
    temp = front;
   if (front==NULL && rear==NULL) {
       printf("Queue is empty\n");

   } else if (front==rear) {

       front = rear = NULL;

   } else {
      front = front->next;
       free(temp);
    }
}
```

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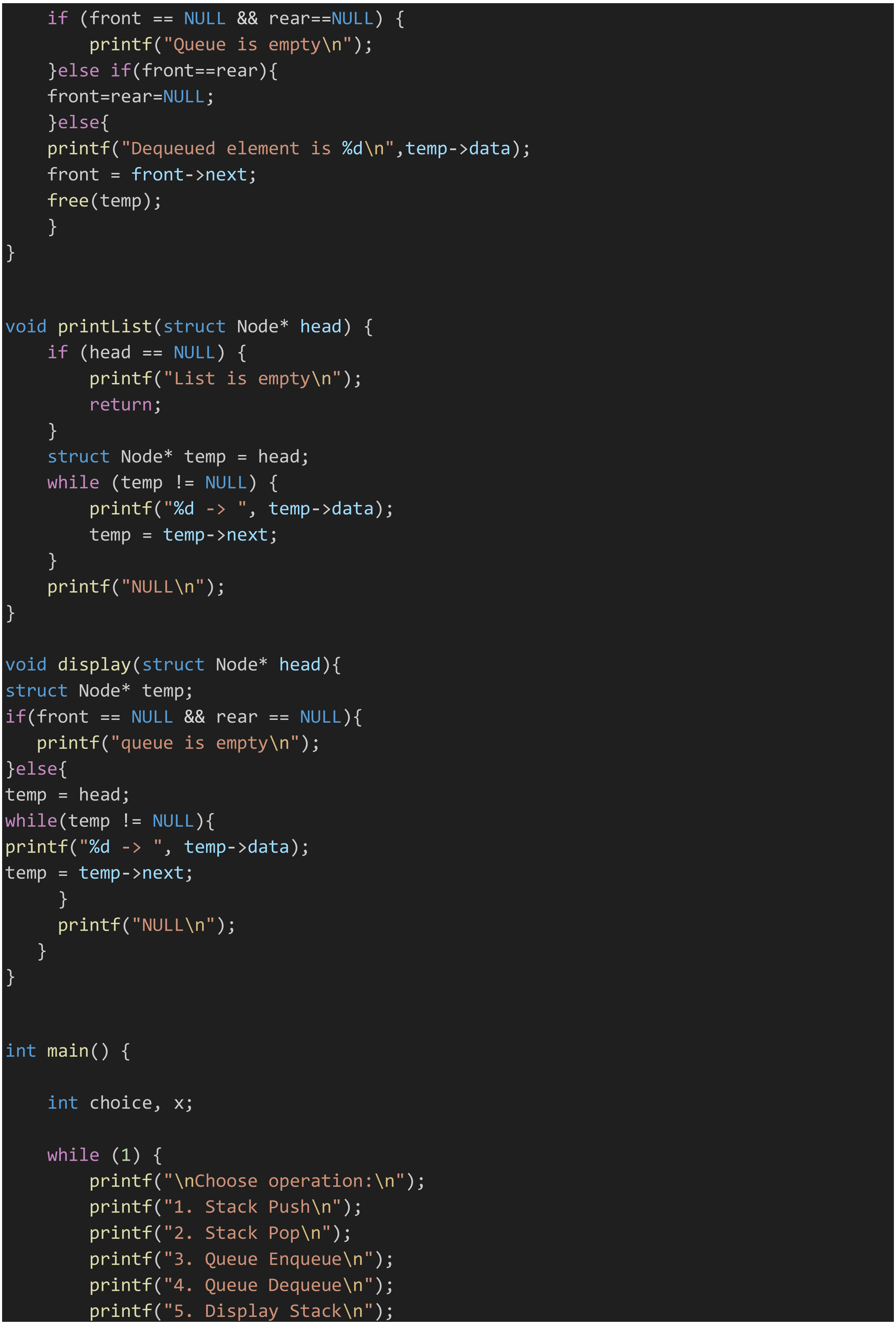
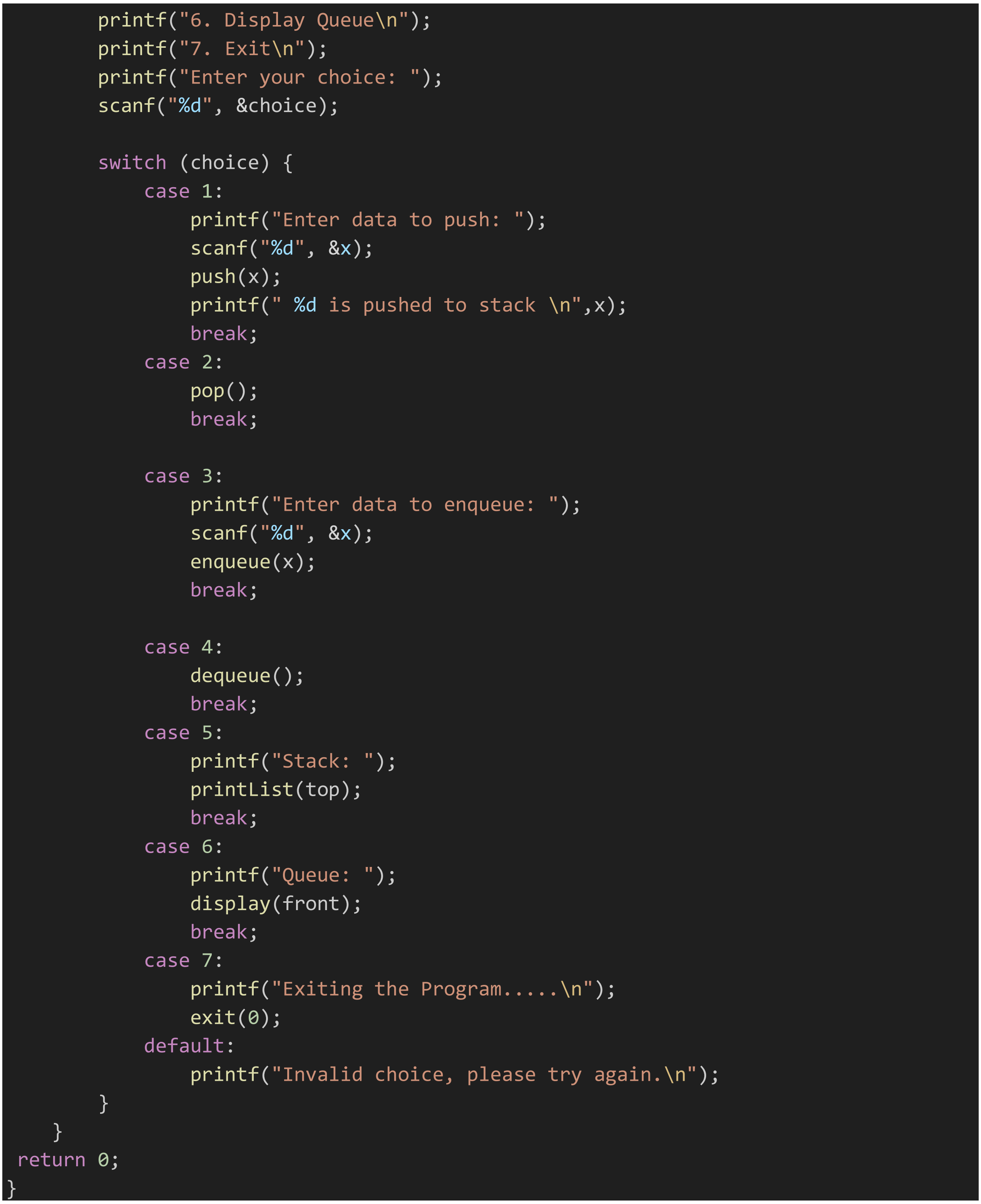
Code:

```
 #include <stdio.h>
#include <stdlib.h>
struct Node {
    int data;
    struct Node* next;
};
struct Node* top=NULL;
struct Node* front=NULL;
struct Node* rear=NULL;

void push(int x) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data=x;
    newNode->next=top;
    top=newNode;
}

void pop() {
    if (top == NULL) {
      printf("Stack Underflow\n");
    }
    struct Node* temp;
    temp=top;
    if(top==NULL){
    printf("Stack is empty\n");
    }else{
    printf("Popped element is %d\n",top->data);
    top = top->next;
    free(temp);
    }
 }

void enqueue(int x) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
     newNode->data=x;
     newNode->next=NULL;
    if(front==NULL && rear==NULL){
    front=rear=newNode;
    }
    else{
    rear->next=newNode;
    rear=newNode;
    }
  }

void dequeue() {
    struct Node* temp;
    temp=front;
```

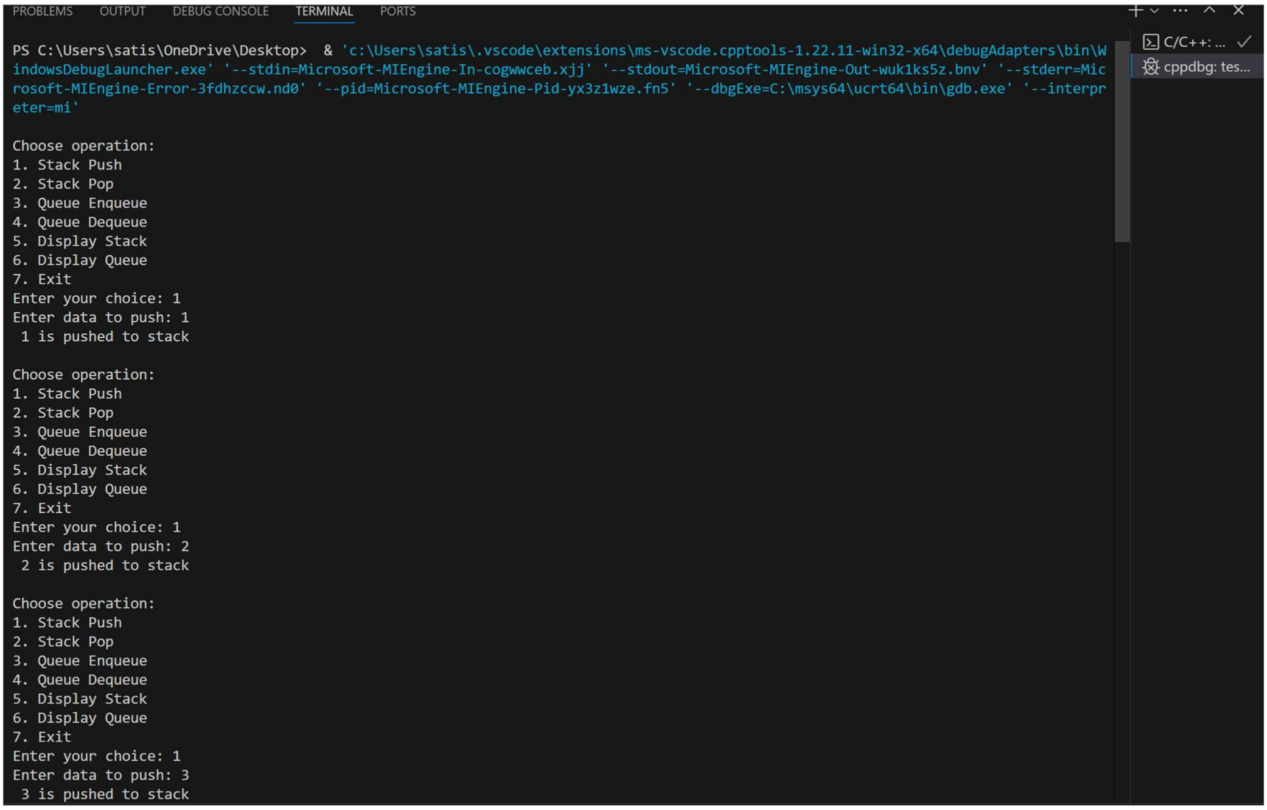


```
    if (front == NULL && rear==NULL) {
        printf("Queue is empty\n");
    }else if(front==rear){
    front=rear=NULL;
    }else{
    printf("Dequeued element is %d\n",temp->data);
    front = front->next;
    free(temp);
    }
}


void printList(struct Node* head) {
    if (head == NULL) {
        printf("List is empty\n");
        return;
    }
    struct Node* temp = head;
    while (temp != NULL) {
        printf("%d -> ", temp->data);
        temp = temp->next;
    }
    printf("NULL\n");
}

void display(struct Node* head){
struct Node* temp;
if(front == NULL && rear == NULL){
   printf("queue is empty\n");
}else{
temp = head;
while(temp != NULL){
printf("%d -> ", temp->data);
temp = temp->next;
     }
     printf("NULL\n");
   }
}


int main() {

    int choice, x;

    while (1) {
        printf("\nChoose operation:\n");
        printf("1. Stack Push\n");
        printf("2. Stack Pop\n");
        printf("3. Queue Enqueue\n");
        printf("4. Queue Dequeue\n");
        printf("5. Display Stack\n");
```

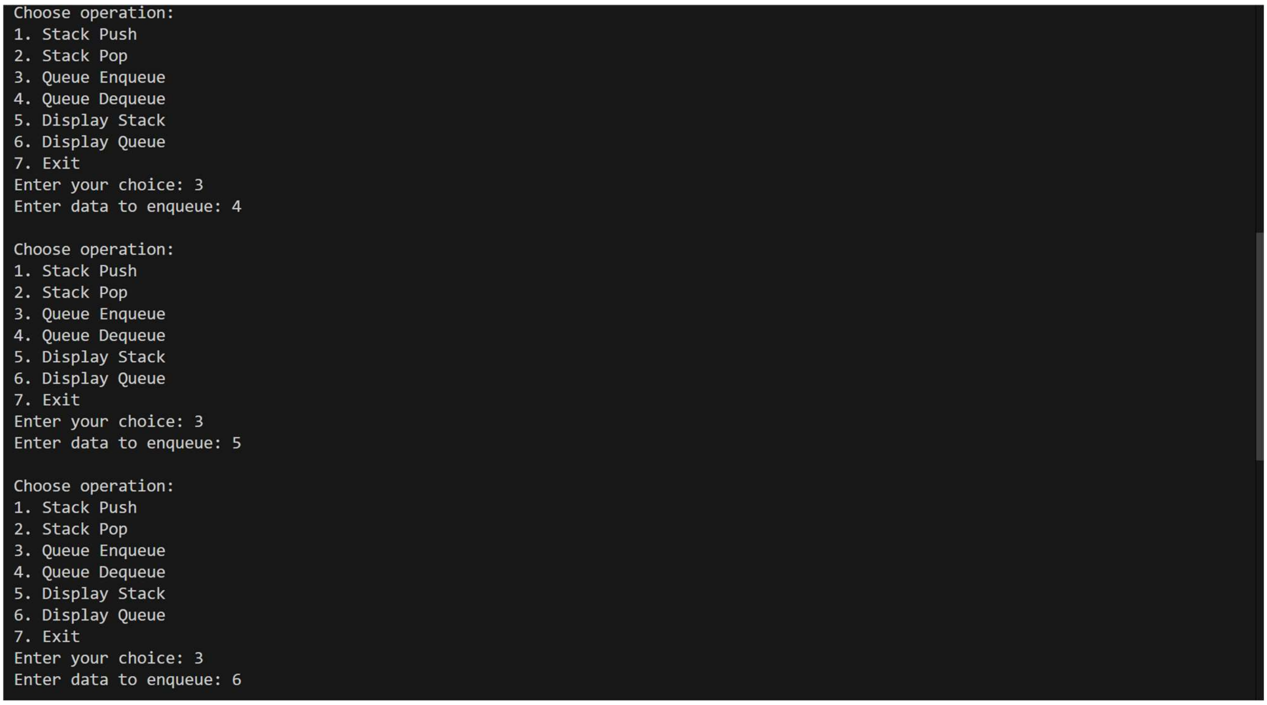


```
        printf("6. Display Queue\n");
        printf("7. Exit\n");
        printf("Enter your choice: ");
        scanf("%d", &choice);

        switch (choice) {
            case 1:
                printf("Enter data to push: ");
                scanf("%d", &x);
                push(x);
                printf(" %d is pushed to stack \n",x);
                break;
            case 2:
                pop();
                break;

            case 3:
                printf("Enter data to enqueue: ");
                scanf("%d", &x);
                enqueue(x);
                break;

            case 4:
                dequeue();
                break;
            case 5:
                printf("Stack: ");
                printList(top);
                break;
            case 6:
                printf("Queue: ");
                display(front);
                break;
            case 7:
                printf("Exiting the Program.....\n");
                exit(0);
            default:
                printf("Invalid choice, please try again.\n");
        }
    }
 return 0;
}
```

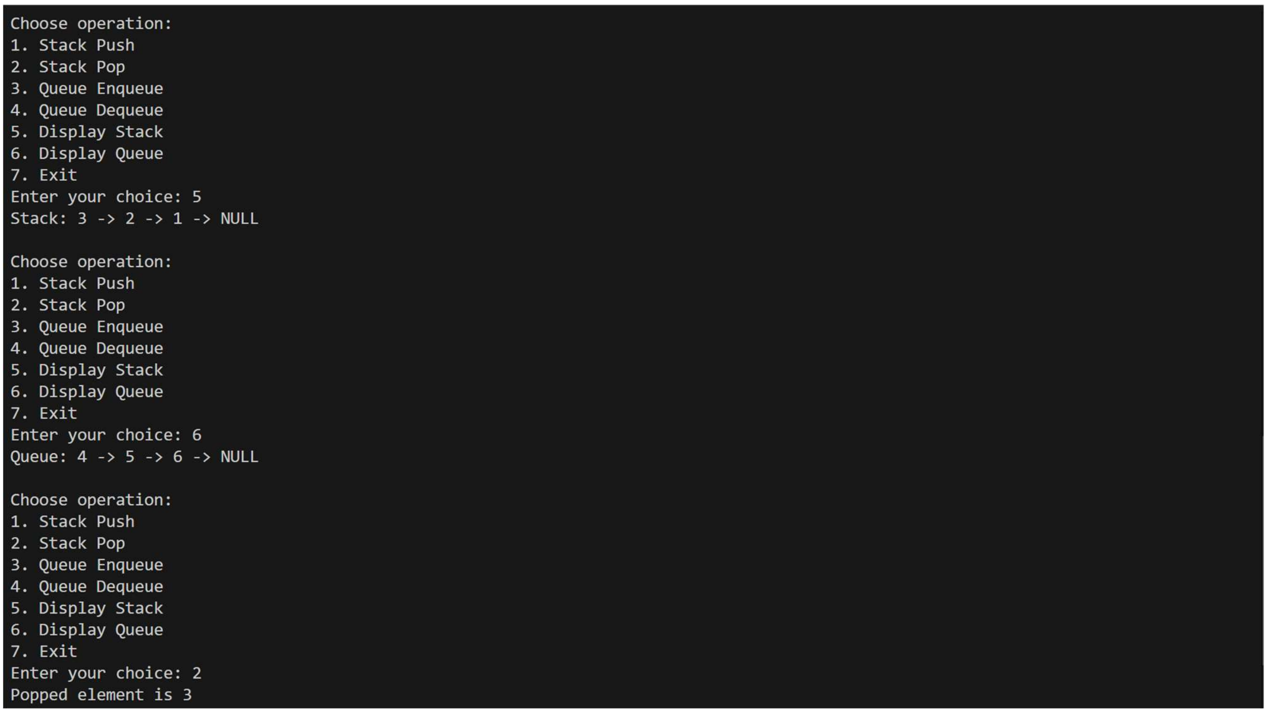
Output:



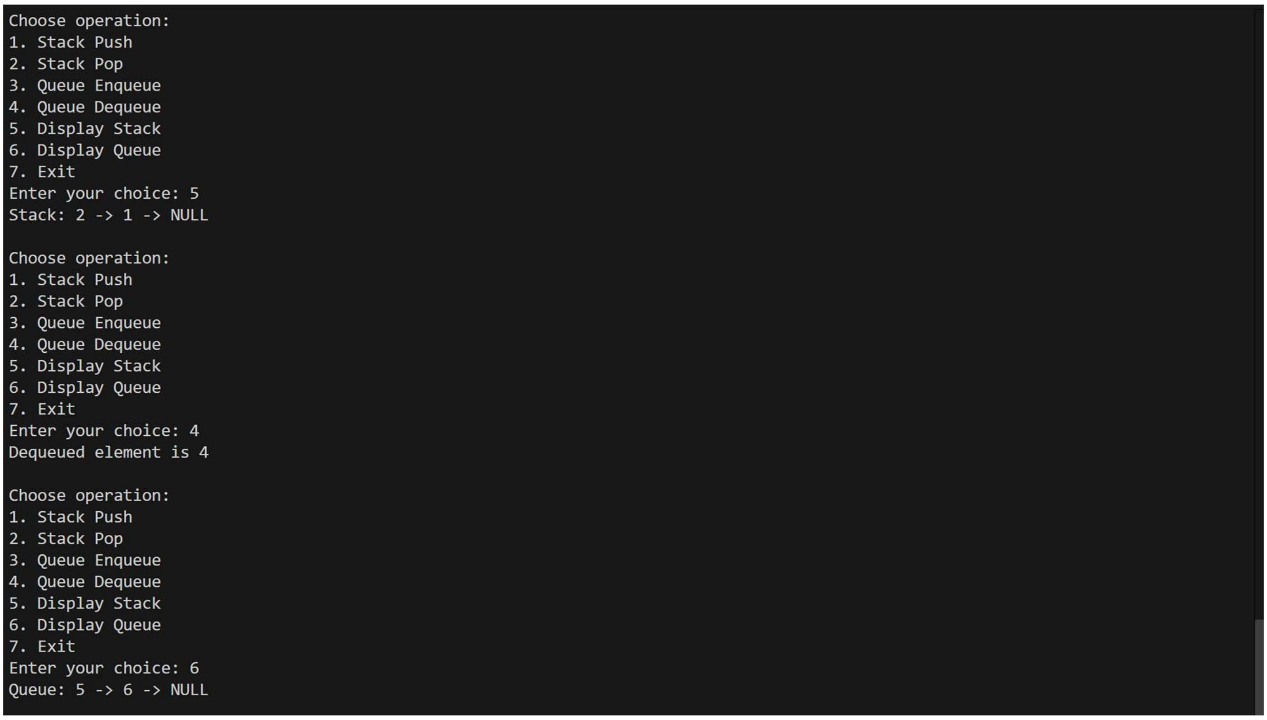
```
PS C:\Users\satis\OneDrive\Desktop>  & 'c:\Users\satis\.vscode\extensions\ms-vscode.cpptools-1.22.11-win32-x64\debugAdapters\bin\W
indowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-cogwwceb.xjj' '--stdout=Microsoft-MIEngine-Out-wuk1ks5z.bnv' '--stderr=Mic
rosoft-MIEngine-Error-3fdhzccw.nd0' '--pid=Microsoft-MIEngine-Pid-yx3z1wze.fn5' '--dbgExe=C:\msys64\ucrt64\bin\gdb.exe' '--interpr
eter=mi'

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 1
Enter data to push: 1
 1 is pushed to stack

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 1
Enter data to push: 2
 2 is pushed to stack

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 1
Enter data to push: 3
 3 is pushed to stack
```



```
Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 3
Enter data to enqueue: 4

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 3
Enter data to enqueue: 5

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 3
Enter data to enqueue: 6
```



```
Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 5
Stack: 3 -> 2 -> 1 -> NULL

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 6
Queue: 4 -> 5 -> 6 -> NULL

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 2
Popped element is 3
```



```
Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 5
Stack: 2 -> 1 -> NULL

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 4
Dequeued element is 4

Choose operation:
1. Stack Push
2. Stack Pop
3. Queue Enqueue
4. Queue Dequeue
5. Display Stack
6. Display Queue
7. Exit
Enter your choice: 6
Queue: 5 -> 6 -> NULL
```