# National Textile University

## Department of Computer Science

**Subject**

**Operating System**

**Submitted to:**

Sir Nasir Mehmood

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**Submitted by:**

Kashmir Jamshaid

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**Registration Number**

**23-NTU-CS-1167**

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**Lab No.**

**05**

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**Semester**

**5th**

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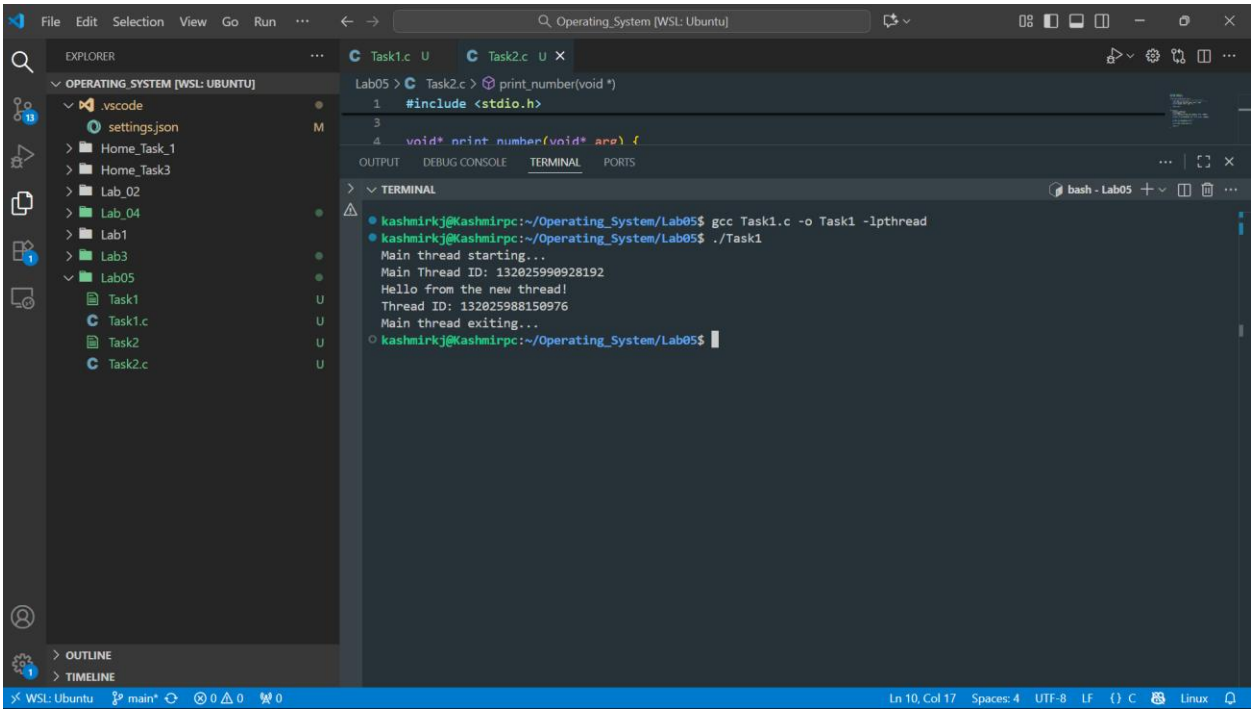
## Task 1:

### Objective: Pass data to a thread function.

## Code :

```
#include <stdio.h>
#include <pthread.h>
#include <unistd.h>
// Thread function - this will run in the new thread
void* thread_function(void* arg) {
printf("Hello from the new thread!\n");
printf("Thread ID: %lu\n", pthread_self());
return NULL;
}
int main() {
pthread_t thread_id;
printf("Main thread starting...\n");
printf("Main Thread ID: %lu\n", pthread_self());
// Create a new thread
pthread_create(&thread_id, NULL, thread_function, NULL);
// Wait for the thread to finish
pthread_join(thread_id, NULL);
printf("Main thread exiting...\n");
return 0;
}
```

## Output:




## Task2:

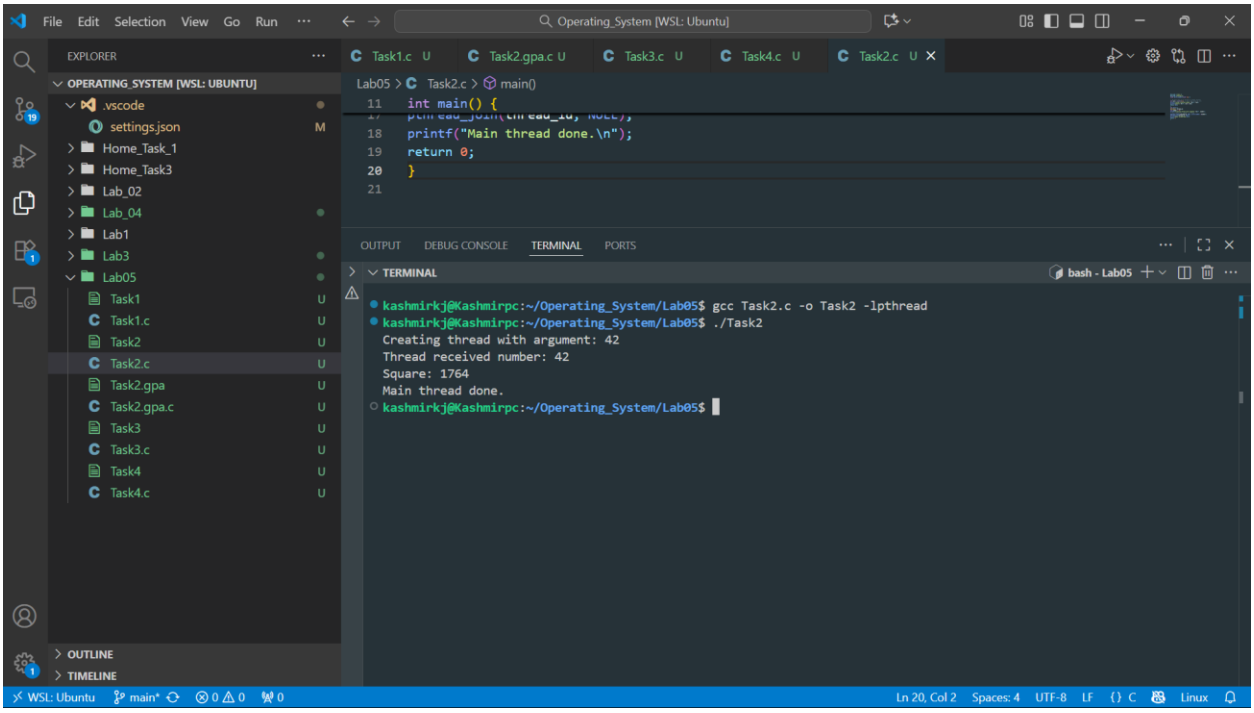
## Pass data to a thread function.

## Code:

```
#include <stdio.h>

#include <pthread.h>

void* print_number(void* arg) {


// We know that we've passed an integer pointer

int num = *(int*)arg; // Cast void* back to int*

printf("Thread received number: %d\n", num);

printf("Square: %d\n", num * num);

return NULL;
```

```
}
int main() {
pthread_t thread_id;
int number = 42;
printf("Creating thread with argument: %d\n", number);
// Pass address of 'number' to thread
pthread_create(&thread_id, NULL, print_number, &number);
pthread_join(thread_id, NULL);
printf("Main thread done.\n");
return 0;
}
```

## OutPut:



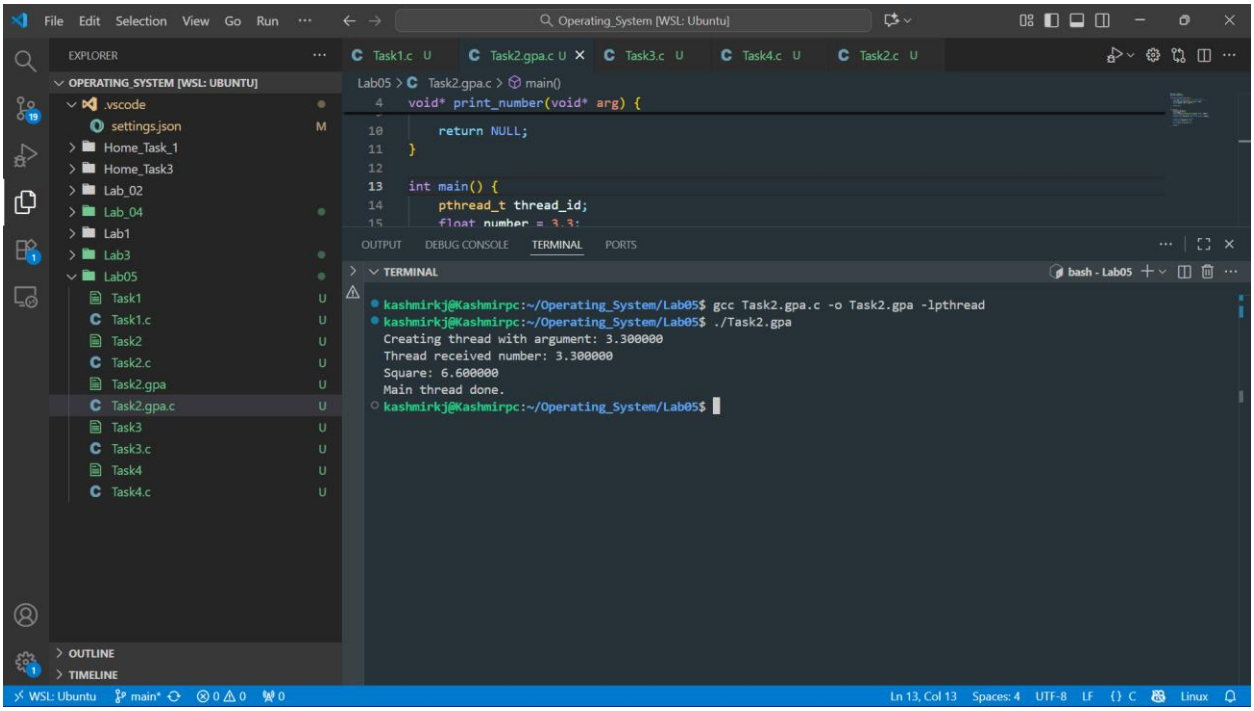

## Task2.gpa :

## Code :

```
#include <stdio.h>

#include <pthread.h>


void* print_number(void* arg) {

   // We know that we've passed an integer pointer

   float num = *(float*)arg;  // Cast void* back to int*

   printf("Thread received number: %f\n", num);

   printf("Square: %f\n", num * 2);


   return NULL;

}
```

```
int main() {
    pthread_t thread_id;
    float number = 3.3;
    printf("Creating thread with argument: %f\n", number);
    // Pass address of 'number' to thread
    pthread_create(&thread_id, NULL, print_number, &number);

    // Wait for the thread to finish
    pthread_join(thread_id, NULL);

    printf("Main thread done.\n");

    return 0;
}
```

## OutPut:




## Task3

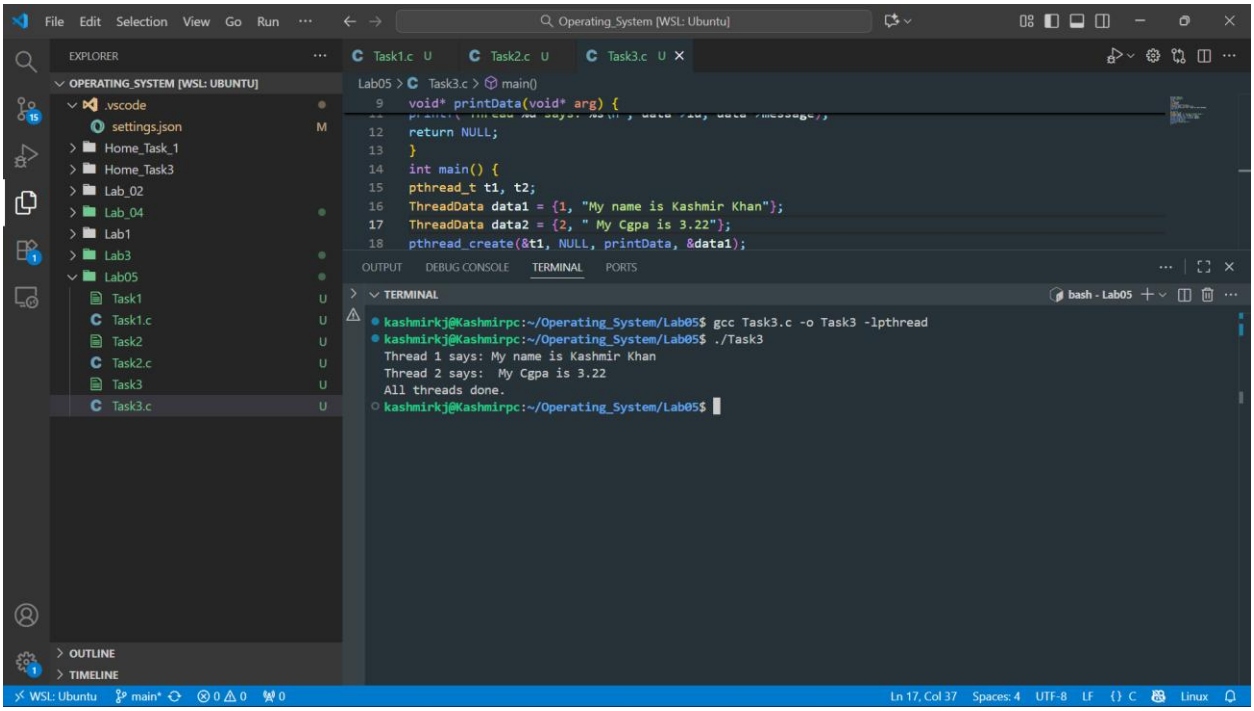
## Passing Multiple Data(My name && Gpa )

## Code:

```
#include <stdio.h>

#include <pthread.h>

typedef struct {

int id;

char* message;

} ThreadData;

void* printData(void* arg) {

ThreadData* data = (ThreadData*)arg;

printf("Thread %d says: %s\n", data->id, data->message);
```

```
return NULL;
}
int main() {
pthread_t t1, t2;
ThreadData data1 = {1, "My name is Kashmir Khan"};
ThreadData data2 = {2, " My Cgpa is 3.22"};
pthread_create(&t1, NULL, printData, &data1);
pthread_create(&t2, NULL, printData, &data2);
pthread_join(t1, NULL);
pthread_join(t2, NULL);
printf("All threads done.\n");
return 0;
}
```

## Output:




## Task3.a:

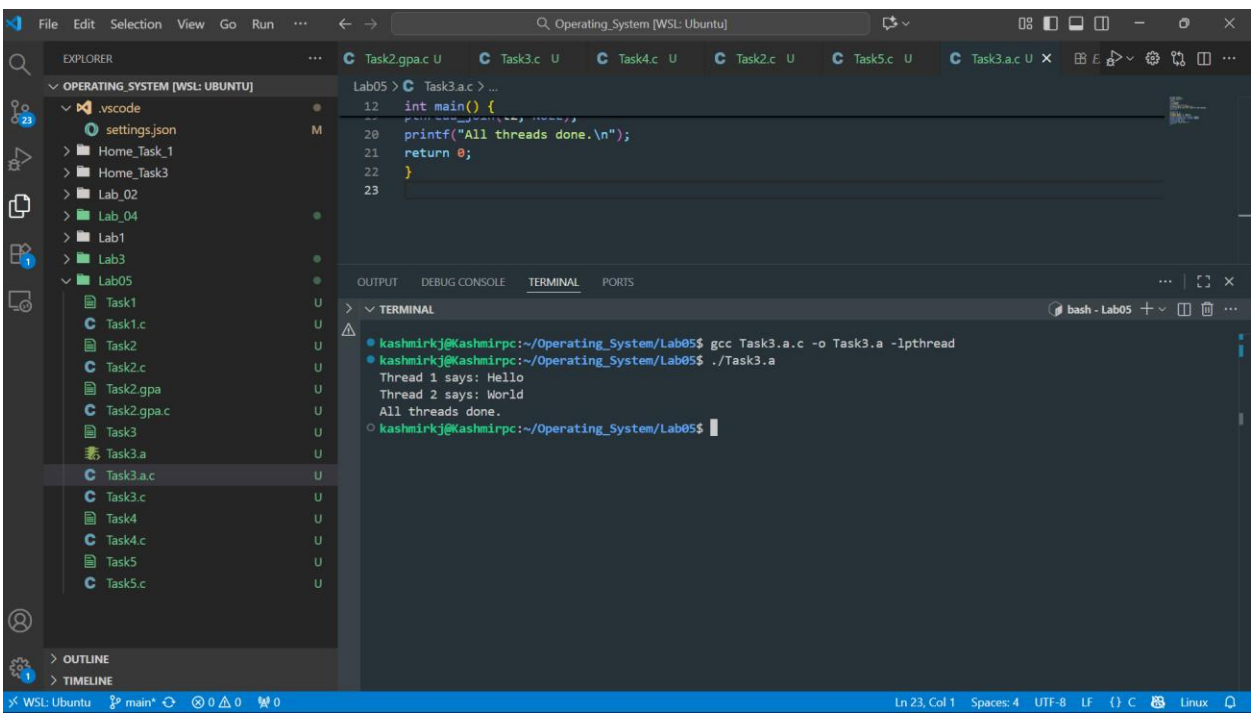
## Passing Multiple Data

## Code:

```
#include <stdio.h>

#include <pthread.h>

typedef struct {

int id;

char* message;

} ThreadData;

void* printData(void* arg) {

ThreadData* data = (ThreadData*)arg;

printf("Thread %d says: %s\n", data->id, data->message);

return NULL;
```

```
}
int main() {
pthread_t t1, t2;
ThreadData data1 = {1, "Hello"};
ThreadData data2 = {2, "World"};
pthread_create(&t1, NULL, printData, &data1);
pthread_create(&t2, NULL, printData, &data2);
pthread_join(t1, NULL);
pthread_join(t2, NULL);
printf("All threads done.\n");
return 0;
}
```

## Output:



# Task4

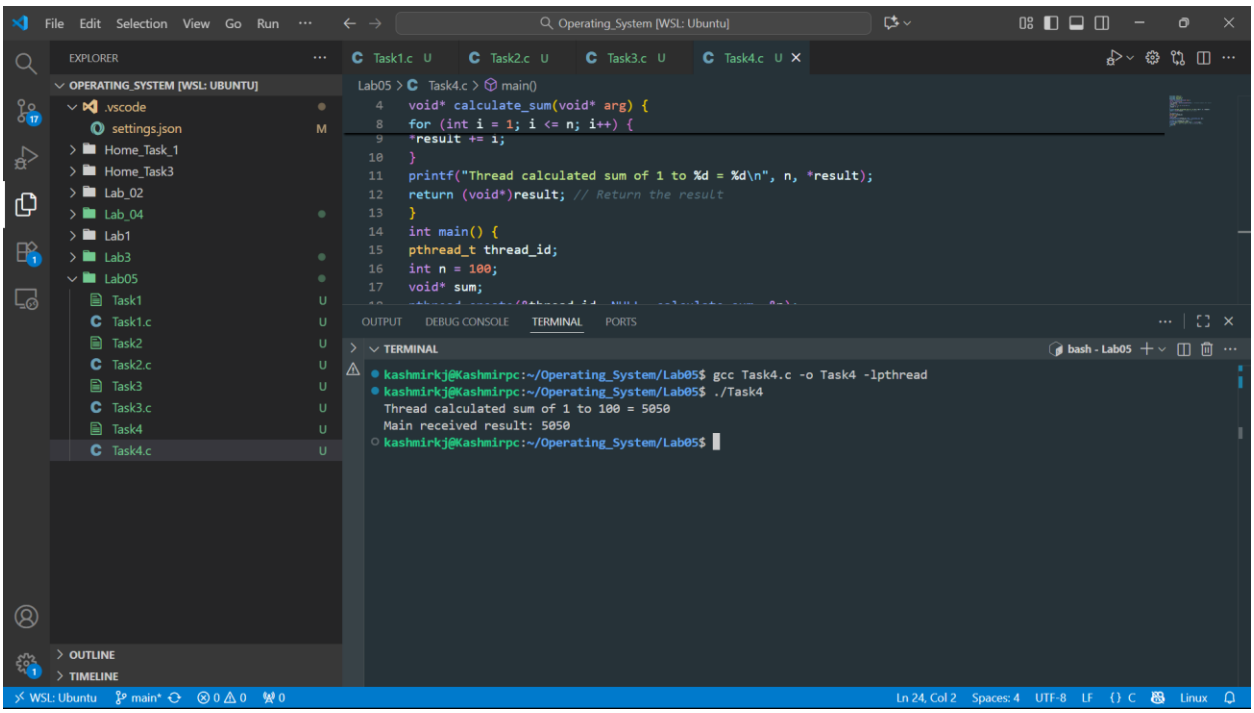
## Code:

```
#include <stdio.h>
#include <pthread.h>
#include <stdlib.h>
void* calculate_sum(void* arg) {
int n = *(int*)arg;
int* result = malloc(sizeof(int)); // Allocate memory for result
*result = 0;
for (int i = 1; i <= n; i++) {
*result += i;
}
printf("Thread calculated sum of 1 to %d = %d\n", n, *result);
return (void*)result; // Return the result
}
int main() {
pthread_t thread_id;
int n = 100;
void* sum;
pthread_create(&thread_id, NULL, calculate_sum, &n);
// Get the return value from thread
pthread_join(thread_id, &sum);
printf("Main received result: %d\n", *(int*)sum);
free(sum); // Don't forget to free allocated memory
```

return 0;

}

## Output:




## Task5

## Program 1: Creating and Running Multiple Threads

## Code:

#include <stdio.h>

#include <pthread.h>

#include <unistd.h>

void* worker(void* arg) {

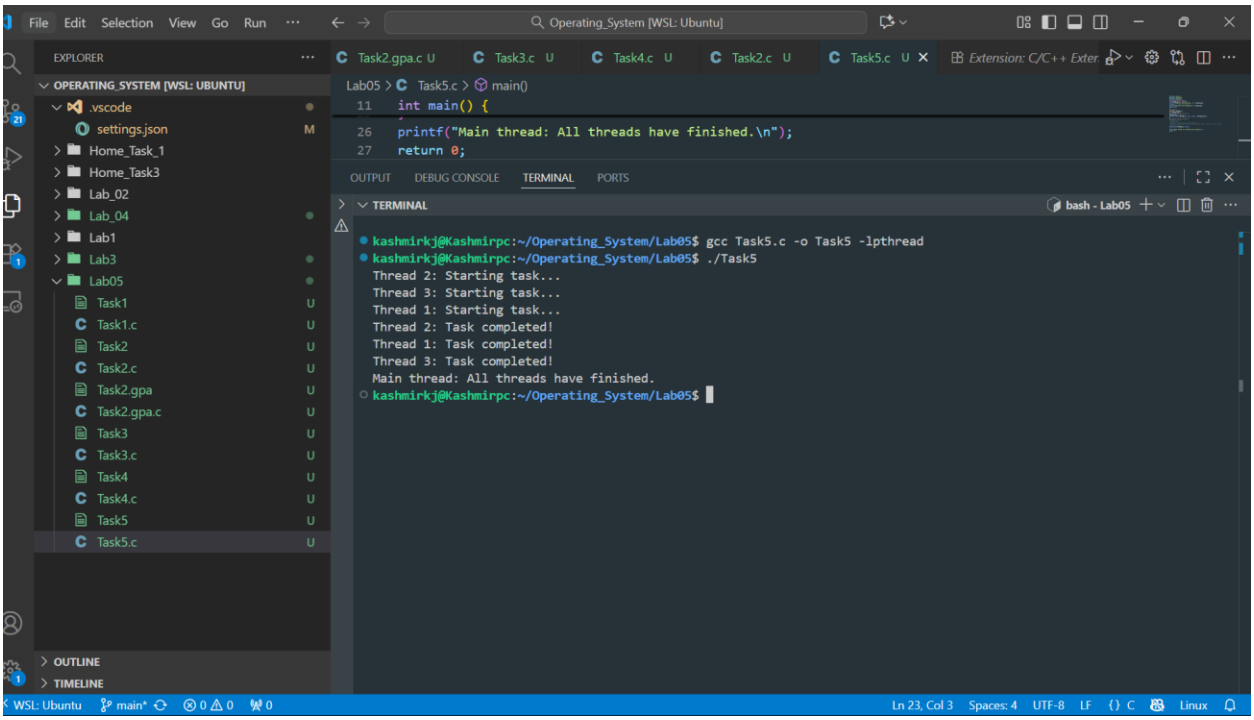
int thread_num = *(int*)arg;

printf("Thread %d: Starting task...\n", thread_num);

sleep(1); *// Simulate some work*

```
printf("Thread %d: Task completed!\n", thread_num);
return NULL;
}
int main() {
pthread_t threads[3];
int thread_ids[3];
for (int i = 0; i < 3; i++) {
thread_ids[i] = i + 1;
pthread_create(&threads[i], NULL, worker, &thread_ids[i]);
}
for (int i = 0; i < 3; i++) {

pthread_join(threads[i], NULL);
}
printf("Main thread: All threads have finished.\n");
return 0;
}
```

## Output:




## Task 6

## What happens when multiple threads modify a shared variable without

## synchronization.

## Code:

```
#include <stdio.h>

#include <pthread.h>

int counter = 0; // Shared variable

void* increment(void* arg) {

for (int i = 0; i < 100000; i++) {

counter++; // Not thread-safe

}

return NULL;
```

```
}
int main() {
pthread_t t1, t2;
pthread_create(&t1, NULL, increment, NULL);
pthread_create(&t2, NULL, increment, NULL);
pthread_join(t1, NULL);
pthread_join(t2, NULL);
printf("Expected counter value: 200000\n");

printf("Actual counter value: %d\n", counter);
return 0;
}
```

## Output: