WEEK 6

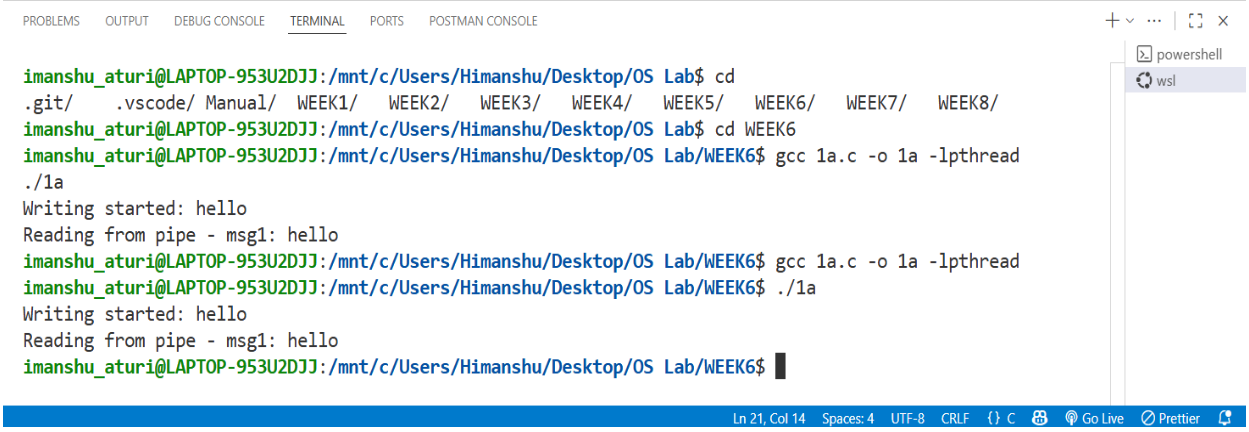
Program 1) Write a program to communicate parent and child process with each other in such a way that whenever child writes something, parent process can read it. Consider mode of communication is through.

a. pipe

Source Code:

```
#include <stdio.h>

#include <unistd.h>

#include <string.h>

int main()

{

   int p[2];

   int returnstatus;

   char writing[2][25] = {"hello", "world"};

   char readmsg[25];

   returnstatus = pipe(p);

   if (returnstatus == -1)

   {

      printf("Pipe not created\n");

      return 1;

   }

   printf("Writing started: %s\n", writing[0]);

   write(p[1], writing[0], strlen(writing[0]) + 1);

   read(p[0], readmsg, sizeof(readmsg));

   printf("Reading from pipe - msg1: %s\n", readmsg);

   return 0;

}
```

OUTPUT



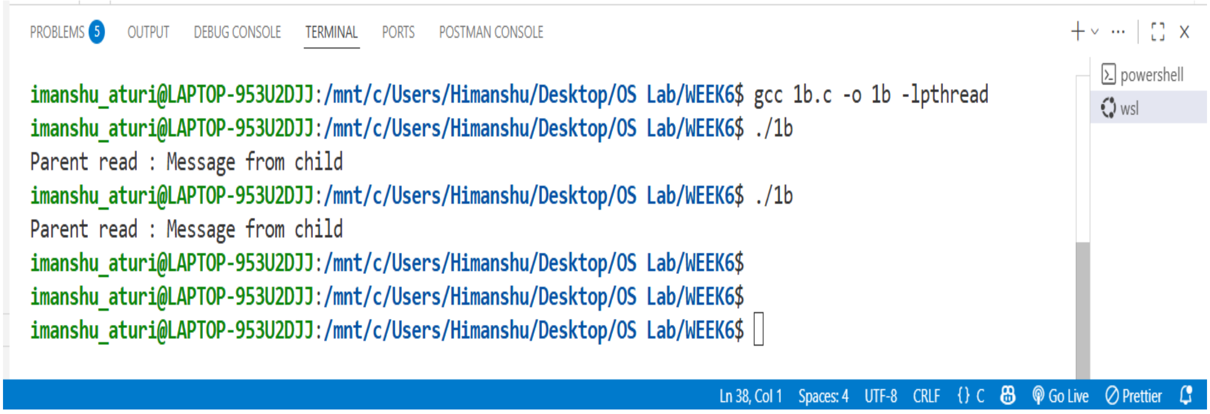
```
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab$ cd
.git/     .vscode/ Manual/  WEEK1/    WEEK2/    WEEK3/    WEEK4/    WEEK5/    WEEK6/    WEEK7/    WEEK8/
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab$ cd WEEK6
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 1a.c -o 1a -lpthread
./1a
Writing started: hello
Reading from pipe - msg1: hello
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 1a.c -o 1a -lpthread
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./1a
Writing started: hello
Reading from pipe - msg1: hello
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ 
```

b) message passing

Source Code:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <string.h>
#include <unistd.h>
struct msg_buffer
{   long msg_type;
   char msg_text[100];
} message;
void main()
{
   key_t key;
   int msgid;
   key = ftok("progfile", 65);
   msgid = msgget(key, 0666 | IPC_CREAT);
   message.msg_type = 1;
   if (fork() == 0)
   {   strcpy(message.msg_text, "Message from child");
      msgsnd(msgid, &message, sizeof(message), 0);
   }
   else
   {      msgrcv(msgid, &message, sizeof(message), 1, 0);
      printf("Parent read : %s\n", message.msg_text);
      msgctl(msgid, IPC_RMID, NULL);
   }
}
```

OUTPUT



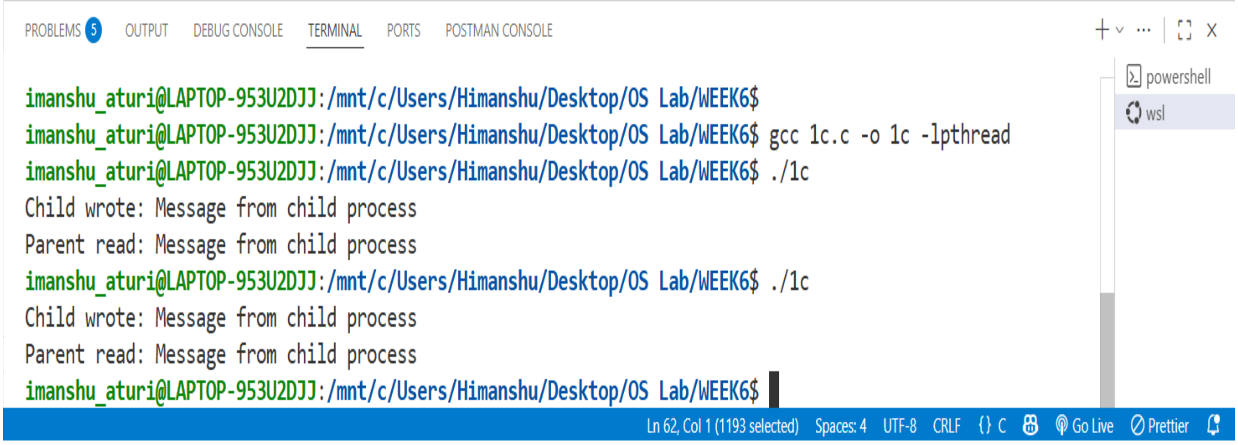
```
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 1b.c -o 1b -lpthread
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./1b
Parent read : Message from child
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./1b
Parent read : Message from child
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$
```

c) shared memory

Source Code:

```
#include <stdio.h>

#include <stdlib.h>

#include <string.h>

#include <sys/ipc.h>

#include <sys/shm.h>

#include <sys/types.h>

#include <unistd.h>

int main()

{

    key_t key;

    int shmid;

    char *shared_memory;

    key = ftok(".", 65);

    if (key == -1)

    {

        perror("ftok");

        exit(1);

    }

    shmid = shmget(key, 1024, 0666 | IPC_CREAT);

    if (shmid == -1)

    {

        perror("shmget");

        exit(1);

    }

    if (fork() == 0)

    {

        shared_memory = (char *)shmat(shmid, NULL, 0);
        if (shared_memory == (char *)(-1))
        {
            perror("shmat");
            exit(1);
        }

        strcpy(shared_memory, "Message from child process");
        printf("Child wrote: %s\n", shared_memory);

        shmdt(shared_memory);
    }
    else
    {
        sleep(1);

        shared_memory = (char *)shmat(shmid, NULL, 0);
        if (shared_memory == (char *)(-1))
        {
            perror("shmat");
            exit(1);
        }

        printf("Parent read: %s\n", shared_memory);

        shmdt(shared_memory);
        shmctl(shmid, IPC_RMID, NULL);
    }
    return 0;
}
```

OUTPUT:



```
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 1c.c -o 1c -lpthread
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./1c
Child wrote: Message from child process
Parent read: Message from child process
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./1c
Child wrote: Message from child process
Parent read: Message from child process
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$
```

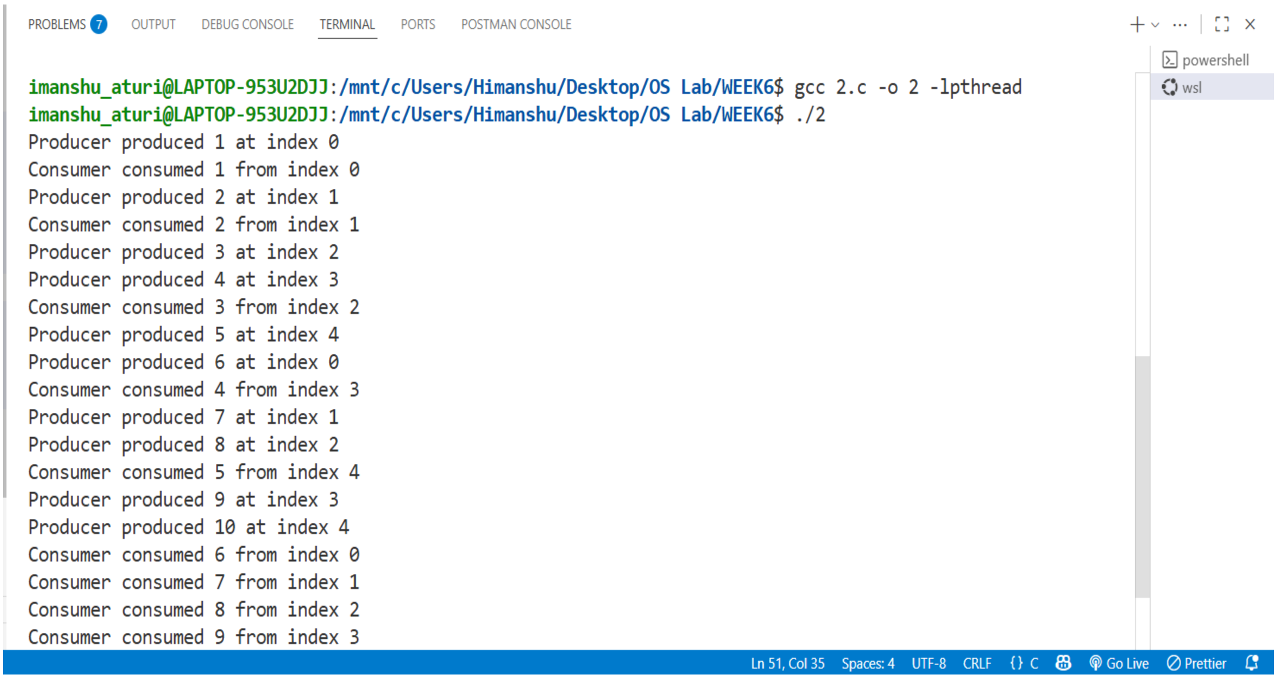
Program2) Write a program to implement the concept of Producer-Consumer problem using semaphores.

Source Code:

```
#include <stdio.h>

#include <pthread.h>

#include <semaphore.h>

#include <unistd.h>

#define BUFFER_SIZE 5

int buffer[BUFFER_SIZE];

int in = 0, out = 0;

sem_t empty;

sem_t full;

pthread_mutex_t mutex = PTHREAD_MUTEX_INITIALIZER;

void *producer(void *args)

{

  int item;

  for (int i = 0; i < 10; i++)

  {

    item = i + 1;

    sem_wait(&empty);

    pthread_mutex_lock(&mutex);

    buffer[in] = item;

    printf("Producer produced %d at index %d\n", item, in);

    in = (in + 1) % BUFFER_SIZE;

    pthread_mutex_unlock(&mutex);

    sem_post(&full);

    sleep(1);

  }

  return NULL;

}
```

```
void *consumer(void *args)
{
   int item;
   for (int i = 0; i < 10; i++)
   {
      sem_wait(&full);
      pthread_mutex_lock(&mutex);
      item = buffer[out];
      printf("Consumer consumed %d from index %d\n", item, out);
      out = (out + 1) % BUFFER_SIZE;
      pthread_mutex_unlock(&mutex);
      sem_post(&empty);
      sleep(2);
   }
   return NULL;
}
int main()
{
   pthread_t prod, cons;
   sem_init(&empty, 0, BUFFER_SIZE);
   sem_init(&full, 0, 0);
   pthread_create(&prod, NULL, producer, NULL);
   pthread_create(&cons, NULL, consumer, NULL);
   pthread_join(prod, NULL);
   pthread_join(cons, NULL);
   sem_destroy(&empty);
   sem_destroy(&full);
   pthread_mutex_destroy(&mutex);
   return 0;
}
```

OUTPUT:



```
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 2.c -o 2 -lpthread
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./2
Producer produced 1 at index 0
Consumer consumed 1 from index 0
Producer produced 2 at index 1
Consumer consumed 2 from index 1
Producer produced 3 at index 2
Producer produced 4 at index 3
Consumer consumed 3 from index 2
Producer produced 5 at index 4
Producer produced 6 at index 0
Consumer consumed 4 from index 3
Producer produced 7 at index 1
Producer produced 8 at index 2
Consumer consumed 5 from index 4
Producer produced 9 at index 3
Producer produced 10 at index 4
Consumer consumed 6 from index 0
Consumer consumed 7 from index 1
Consumer consumed 8 from index 2
Consumer consumed 9 from index 3
```

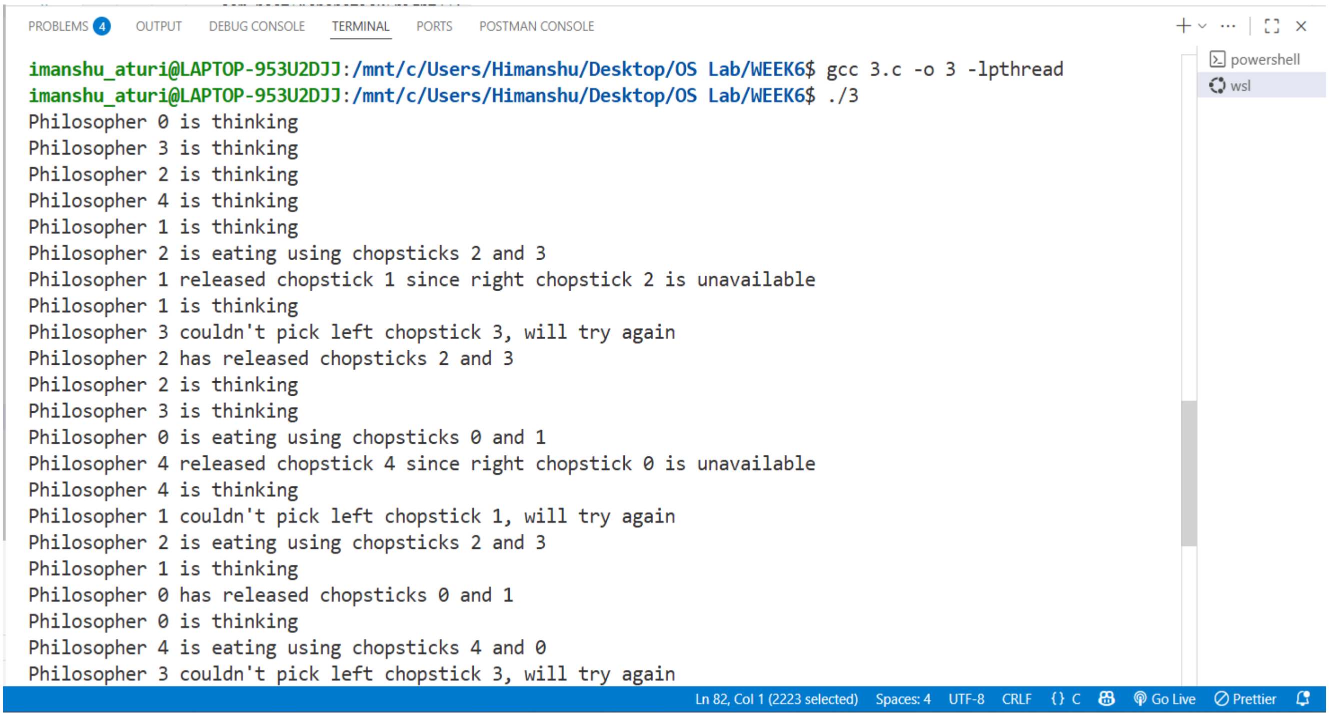
Program3) Write a program to implement the concept of Dining-Philosopher problem.

Source Code:

```
#include <stdio.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>
#include <stdlib.h>
#include <time.h>
#define N 5
sem_t chopstick[N];
void *philosopher(void *num)
{
  int id = *(int *)num;
  while (1)
  {
    printf("Philosopher %d is thinking\n", id);
    sleep(rand() % 3 + 1);
    int left = id;
    int right = (id + 1) % N;
    if (sem_trywait(&chopstick[left]) == 0)
    {
      if (sem_trywait(&chopstick[right]) == 0)
      {
        printf("Philosopher %d is eating using chopsticks %d and %d\n", id, left, right);
        sleep(rand() % 2 + 1); // eating time
        sem_post(&chopstick[left]);
        sem_post(&chopstick[right]);
        printf("Philosopher %d has released chopsticks %d and %d\n", id, left, right);
      }
```

```
            else
            {
                sem_post(&chopstick[left]);
                printf("Philosopher %d released chopstick %d since right chopstick %d is unavailable\n",
                       id, left, right);
            }
        }
        else
        {
            printf("Philosopher %d couldn't pick left chopstick %d, will try again\n", id, left);
        }
        usleep(200); // small delay to reduce CPU usage
    }
    pthread_exit(NULL);
}
void main()
{
    pthread_t tid[N];
    int ids[N];
    srand(time(NULL));
    for (int i = 0; i < N; i++)
        sem_init(&chopstick[i], 0, 1);
    for (int i = 0; i < N; i++)
    {
        ids[i] = i;
        pthread_create(&tid[i], NULL, philosopher, &ids[i]);
    }
    for (int i = 0; i < N; i++)
        pthread_join(tid[i], NULL);
}
```

OUTPUT:



```
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ gcc 3.c -o 3 -lpthread
imanshu_aturi@LAPTOP-953U2DJJ:/mnt/c/Users/Himanshu/Desktop/OS Lab/WEEK6$ ./3
Philosopher 0 is thinking
Philosopher 3 is thinking
Philosopher 2 is thinking
Philosopher 4 is thinking
Philosopher 1 is thinking
Philosopher 2 is eating using chopsticks 2 and 3
Philosopher 1 released chopstick 1 since right chopstick 2 is unavailable
Philosopher 1 is thinking
Philosopher 3 couldn't pick left chopstick 3, will try again
Philosopher 2 has released chopsticks 2 and 3
Philosopher 2 is thinking
Philosopher 3 is thinking
Philosopher 0 is eating using chopsticks 0 and 1
Philosopher 4 released chopstick 4 since right chopstick 0 is unavailable
Philosopher 4 is thinking
Philosopher 1 couldn't pick left chopstick 1, will try again
Philosopher 2 is eating using chopsticks 2 and 3
Philosopher 1 is thinking
Philosopher 0 has released chopsticks 0 and 1
Philosopher 0 is thinking
Philosopher 4 is eating using chopsticks 4 and 0
Philosopher 3 couldn't pick left chopstick 3, will try again
```

WEEK 7

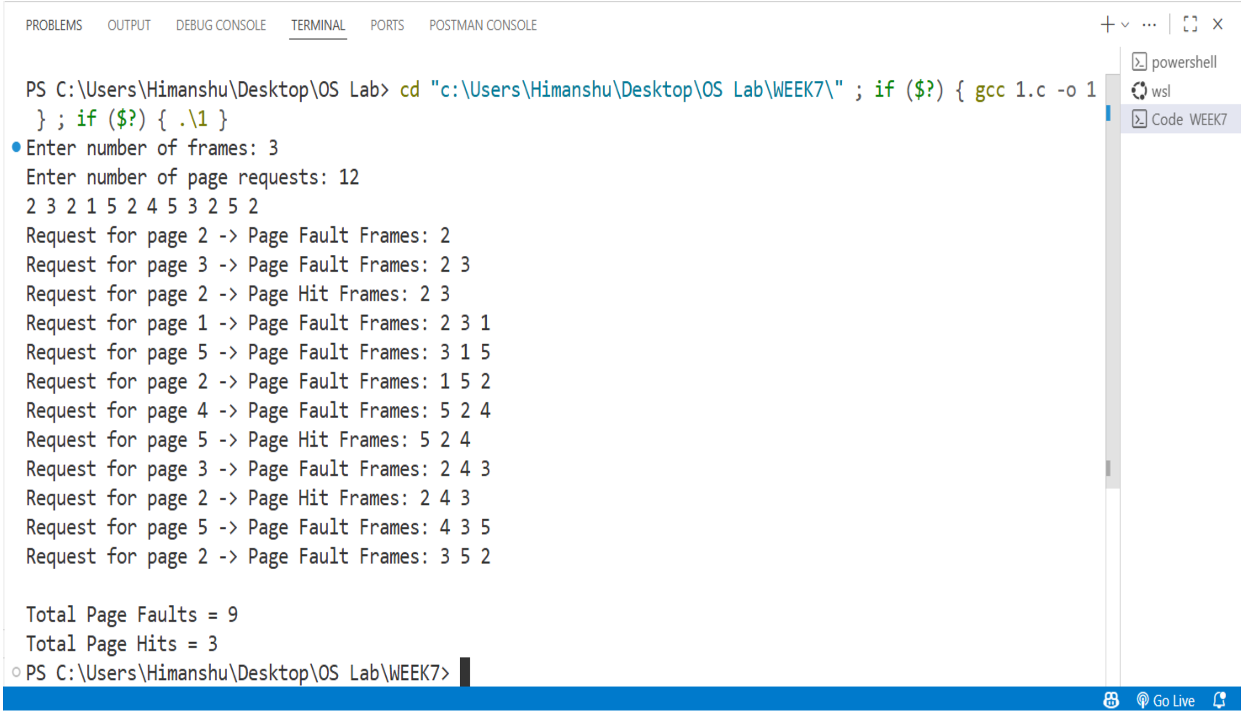
Program1) FIFO – First In First Out : page which came first (i.e. oldest page) need to be moved out.

Source Code:

```
#include <stdio.h>
void enqueue(int q[], int *front, int *rear, int v, int n)
{
   if (*rear - *front + 1 == n)
   {
      printf("Queue is full\n");
      return;
   }else
   {
      if (*front == -1)
         *front = 0;
      q[++(*rear)] = v;
   }
}
int dequeue(int q[], int *front, int *rear)
{
   int v;
   if (*front == -1)
   {
      printf("Queue is empty\n");
      return -1;
   }
   else
   {
      v = q[*front];
      (*front)++;
```

```
        if (*front > *rear)
        {
            *front = -1;
            *rear = -1;
        } }
    return v;
}
int isPresent(int q[], int front, int rear, int page)
{
    if (front == -1)
        return 0;
    for (int i = front; i <= rear; i++)
    {   if (q[i] == page)
            return 1; }
    return 0;
}
void display(int q[], int front, int rear)
{
    if (front == -1)
    {
        printf("Queue is empty\n");
        return;
    }
    for (int i = front; i <= rear; i++)
        printf("%d ", q[i]);
    printf("\n");
}
void main()
{
    int n, m;
    printf("Enter number of frames: ");
    scanf("%d", &n);
    printf("Enter number of page requests: ");
    scanf("%d", &m);
    int pages[m];
    for (int i = 0; i < m; i++)
        scanf("%d", &pages[i]);
    int q[20];
    int front = -1, rear = -1;
    int pageFaults = 0;
    for (int i = 0; i < m; i++)
    {
        int page = pages[i];
        printf("Request for page %d -> ", page);
        if (!isPresent(q, front, rear, page))
        {  pageFaults++;
            if (front == -1 || rear - front + 1 < n)
                enqueue(q, &front, &rear, page, n);
            else{
                dequeue(q, &front, &rear);
                enqueue(q, &front, &rear, page, n);
            }
            printf("Page Fault Frames: ");
        } else
            printf("Page Hit Frames: ");
        display(q, front, rear);
    }
    printf("\nTotal Page Faults = %d\n", pageFaults);
    printf("Total Page Hits = %d\n", m - pageFaults);
}
```

OUTPUT:



```
PS C:\Users\Himanshu\Desktop\OS Lab> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK7\" ; if ($?) { gcc 1.c -o 1
 } ; if ($?) { .\1 }
Enter number of frames: 3
Enter number of page requests: 12
2 3 2 1 5 2 4 5 3 2 5 2
Request for page 2 -> Page Fault Frames: 2
Request for page 3 -> Page Fault Frames: 2 3
Request for page 2 -> Page Hit Frames: 2 3
Request for page 1 -> Page Fault Frames: 2 3 1
Request for page 5 -> Page Fault Frames: 3 1 5
Request for page 2 -> Page Fault Frames: 1 5 2
Request for page 4 -> Page Fault Frames: 5 2 4
Request for page 5 -> Page Hit Frames: 5 2 4
Request for page 3 -> Page Fault Frames: 2 4 3
Request for page 2 -> Page Hit Frames: 2 4 3
Request for page 5 -> Page Fault Frames: 4 3 5
Request for page 2 -> Page Fault Frames: 3 5 2

Total Page Faults = 9
Total Page Hits = 3
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK7>
```

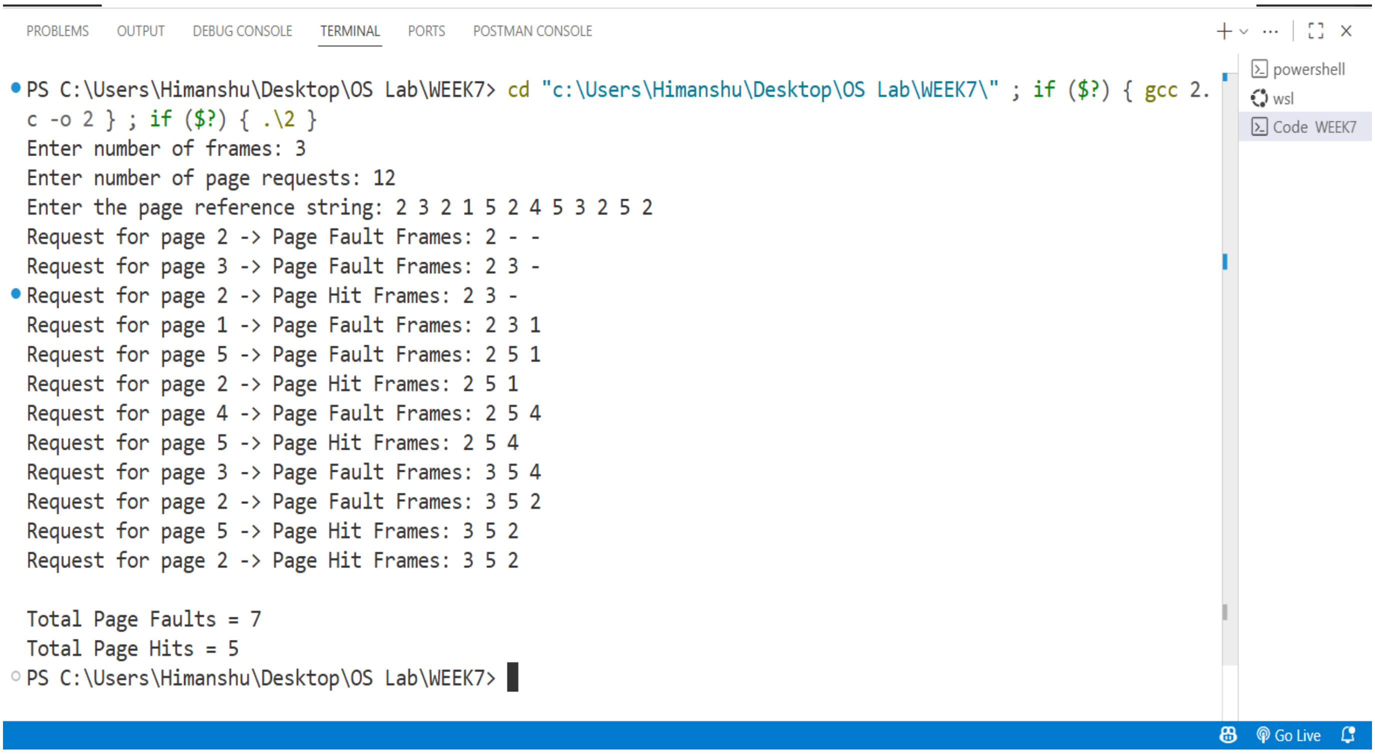
Program2) LRU – Least Recently Used : page which is has not been used for longest Ame need to be moved out.

<u>Source Code:</u>

```
#include <stdio.h>

int isPresent(int frames[], int n, int page) {

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

        if (frames[i] == page)

            return 1;

    }

    return 0;

}

int findLRU(int time[], int n) {

    int min = time[0], pos = 0;

    for (int i = 1; i < n; i++) {

        if (time[i] < min) {

            min = time[i];

            pos = i; }

    }

    return pos;

}

void display(int frames[], int n) {

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

        if (frames[i] != -1)

            printf("%d ", frames[i]);

        else

            printf("- ");

    }

    printf("\n");

}

void main()
```

```
{
    int n, m;
    printf("Enter number of frames: ");
    scanf("%d", &n);
    printf("Enter number of page requests: ");
    scanf("%d", &m);
    int pages[m];
    printf("Enter the page reference string: ");
    for (int i = 0; i < m; i++)
        scanf("%d", &pages[i]);
    int frames[n], time[n];
    int counter = 0, pageFaults = 0;
    for (int i = 0; i < n; i++)
    {
        frames[i] = -1;
        time[i] = 0;
    }
    for (int i = 0; i < m; i++)
    {
        int page = pages[i];
        printf("Request for page %d -> ", page);

        if (isPresent(frames, n, page))
        {
            for (int j = 0; j < n; j++)
            {
                if (frames[j] == page)
                    time[j] = ++counter;
            }
            printf("Page Hit Frames: ");
        }
        else
        {
            pageFaults++;

            int emptyPos = -1;
            for (int j = 0; j < n; j++)
            {
                if (frames[j] == -1)
                {
                    emptyPos = j;
                    break;
                }
            }
            if (emptyPos != -1)
            {
                frames[emptyPos] = page;
                time[emptyPos] = ++counter;
            }else {
               int pos = findLRU(time, n);
                frames[pos] = page;
                time[pos] = ++counter;
            }
            printf("Page Fault Frames: ");
        }
        display(frames, n);
    }
    printf("\nTotal Page Faults = %d\n", pageFaults);
    printf("Total Page Hits = %d\n", m - pageFaults);
}
```

OUTPUT:



```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK7> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK7\" ; if ($?) { gcc 2.
c -o 2 } ; if ($?) { .\2 }
Enter number of frames: 3
Enter number of page requests: 12
Enter the page reference string: 2 3 2 1 5 2 4 5 3 2 5 2
Request for page 2 -> Page Fault Frames: 2 - -
Request for page 3 -> Page Fault Frames: 2 3 -
Request for page 2 -> Page Hit Frames: 2 3 -
Request for page 1 -> Page Fault Frames: 2 3 1
Request for page 5 -> Page Fault Frames: 2 5 1
Request for page 2 -> Page Hit Frames: 2 5 1
Request for page 4 -> Page Fault Frames: 2 5 4
Request for page 5 -> Page Hit Frames: 2 5 4
Request for page 3 -> Page Fault Frames: 3 5 4
Request for page 2 -> Page Fault Frames: 3 5 2
Request for page 5 -> Page Hit Frames: 3 5 2
Request for page 2 -> Page Hit Frames: 3 5 2

Total Page Faults = 7
Total Page Hits = 5
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK7>
```

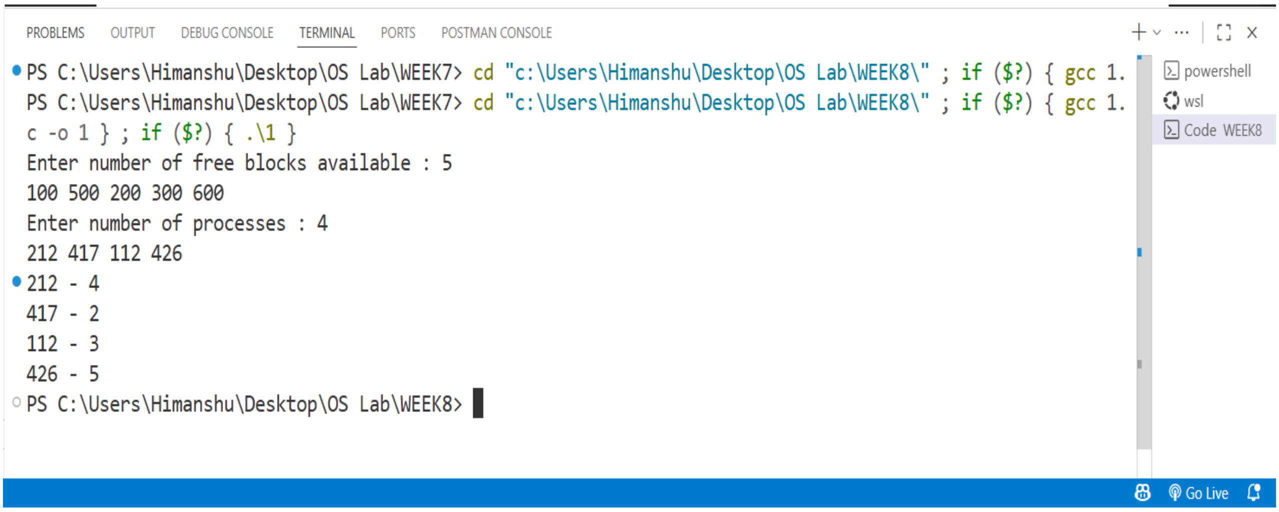
WEEK 8

Program1) Best Fit – block which is closes to the size of request is allocated i.e. the smallest hole that is big enough to allocate to the requesting program.

Source Code:

```
#include <stdio.h>
int main()
{
   int b, p;
   printf("Enter number of free blocks available : ");
   scanf("%d", &b);
   int block[b];
   for (int i = 0; i < b; i++)
      scanf("%d", &block[i]);
   printf("Enter number of processes : ");
   scanf("%d", &p);
   int process[p];
   for (int i = 0; i < p; i++)
      scanf("%d", &process[i]);
   int allocated[p];
   for (int i = 0; i < p; i++)
      allocated[i] = -1;
   for (int i = 0; i < p; i++)
   {
      int bestIdx = -1;
      for (int j = 0; j < b; j++)
      {
         if (block[j] >= process[i])
         {
            if (bestIdx == -1 || block[j] < block[bestIdx])
               bestIdx = j;
            }
        }
        if (bestIdx != -1)
        {
            allocated[i] = bestIdx;
            block[bestIdx] -= process[i];
        }
    }

    for (int i = 0; i < p; i++)
    {
        if (allocated[i] != -1)
            printf("%d - %d\n", process[i], allocated[i] + 1);
        else
            printf("%d no free block allocated\n", process[i]);
    }

    return 0;
}
```

OUTPUT:



```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK7> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK8\" ; if ($?) { gcc 1.
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK7> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK8\" ; if ($?) { gcc 1.
c -o 1 } ; if ($?) { .\1 }
Enter number of free blocks available : 5
100 500 200 300 600
Enter number of processes : 4
212 417 112 426
212 - 4
417 - 2
112 - 3
426 - 5
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK8>
```

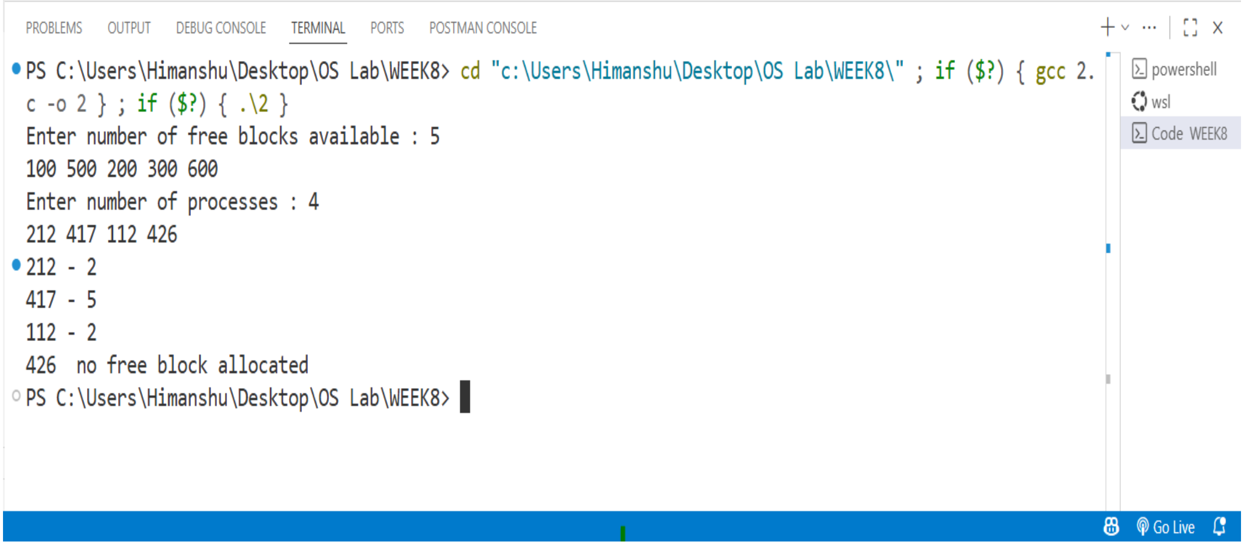
Program 2) First Fit – start searching the list from beginning, take the first block whose size is greater than or equal to the requesting program size and allocate it to program.

Source Code:

```
#include <stdio.h>
int main()
{
   int b, p;
   printf("Enter number of free blocks available : ");
   scanf("%d", &b);
   int block[b];
   for (int i = 0; i < b; i++)
      scanf("%d", &block[i]);
   printf("Enter number of processes : ");
   scanf("%d", &p);
   int process[p];
   for (int i = 0; i < p; i++)
      scanf("%d", &process[i]);
   int allocated[p];
   for (int i = 0; i < p; i++)
      allocated[i] = -1;
   for (int i = 0; i < p; i++)
   {
      for (int j = 0; j < b; j++)
      {
         if (block[j] >= process[i])
         {
            allocated[i] = j;
            block[j] -= process[i];
            break;
         }
```

```
        }
    }

    for (int i = 0; i < p; i++)
    {
        if (allocated[i] != -1)
            printf("%d - %d\n", process[i], allocated[i] + 1);
        else
            printf("%d  no free block allocated\n", process[i]);
    }

    return 0;
}
```

OUTPUT:



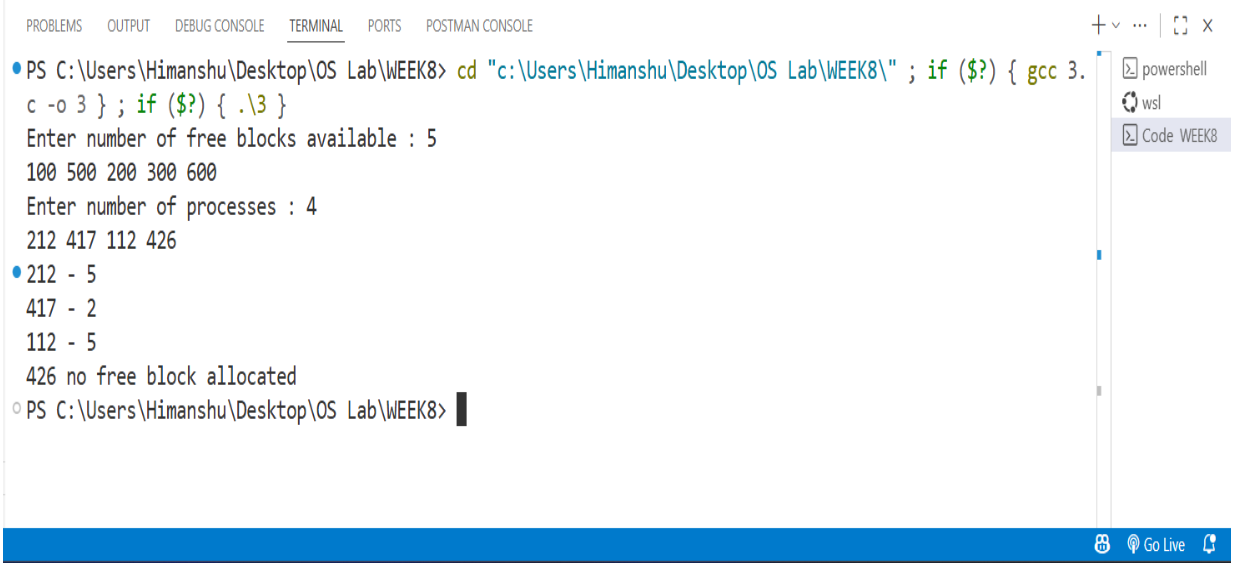
```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK8> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK8\" ; if ($?) { gcc 2.
c -o 2 } ; if ($?) { .\2 }
Enter number of free blocks available : 5
100 500 200 300 600
Enter number of processes : 4
212 417 112 426
212 - 2
417 - 5
112 - 2
426  no free block allocated
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK8>
```

Program3) Worst Fit – block which is largest among all is allocated for the program.

Source Code:

```
#include <stdio.h>
int main()
{
  int b, p;
  printf("Enter number of free blocks available : ");
  scanf("%d", &b);

  int block[b];
  for (int i = 0; i < b; i++)
    scanf("%d", &block[i]);

  printf("Enter number of processes : ");
  scanf("%d", &p);

  int process[p];
  for (int i = 0; i < p; i++)
    scanf("%d", &process[i]);

  int allocated[p];
  for (int i = 0; i < p; i++)
    allocated[i] = -1;

  for (int i = 0; i < p; i++)
  {
    int worstIdx = -1;
    for (int j = 0; j < b; j++)
    {
            if (block[j] >= process[i])
            {
                if (worstIdx == -1 || block[j] > block[worstIdx])
                    worstIdx = j;
            }
        }
        if (worstIdx != -1)
        {
            allocated[i] = worstIdx;
            block[worstIdx] -= process[i];
        }
    }

    for (int i = 0; i < p; i++)
    {
        if (allocated[i] != -1)
            printf("%d - %d\n", process[i], allocated[i] + 1);
        else
            printf("%d no free block allocated\n", process[i]);
    }

    return 0;
}
```

OUTPUT:



```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK8> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK8\" ; if ($?) { gcc 3.
c -o 3 } ; if ($?) { .\3 }
Enter number of free blocks available : 5
100 500 200 300 600
Enter number of processes : 4
212 417 112 426
212 - 5
417 - 2
112 - 5
426 no free block allocated
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK8>
```

WEEK 9-10

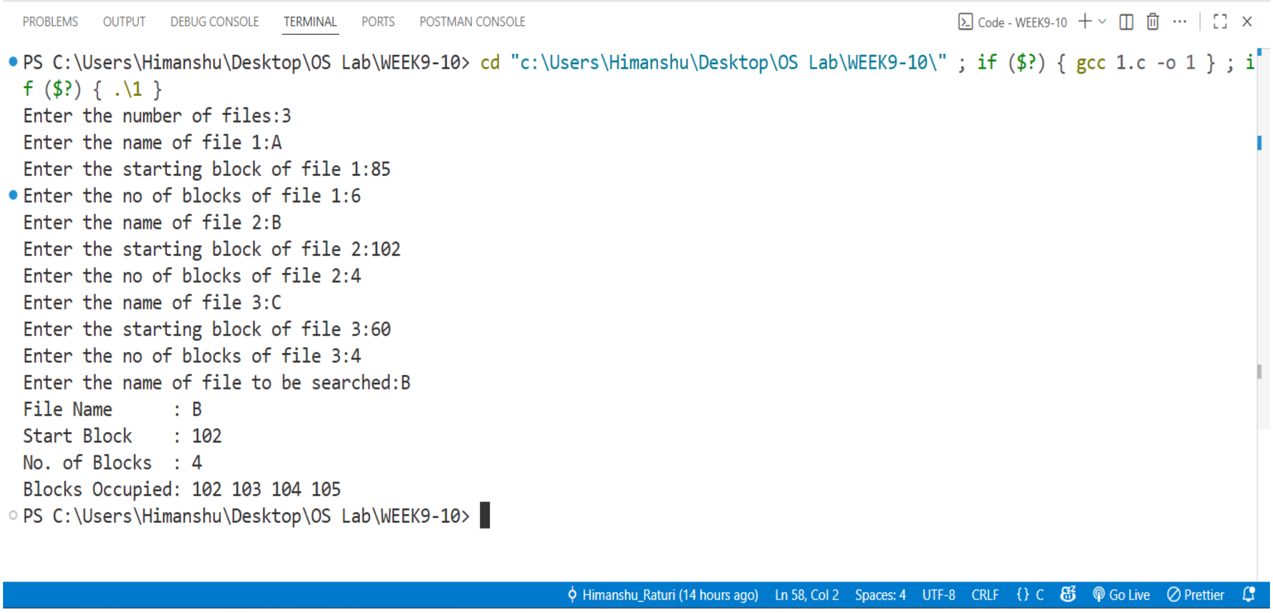
Program1) Write a program to implement Sequential file allocation strategies.

Source Code:

```
#include <stdio.h>

#include <stdbool.h>

typedef struct file

{

   char name;

   int start_block;

   int no_of_blocks;

} file;

void main()

{

   bool blocks[1000] = {true};

   int n;

   printf("Enter the number of files:");

   scanf("%d", &n);

   file files[n];

   for (int i = 0; i < n; i++)

   {

      getchar();

      printf("Enter the name of file %d:", i + 1);

      scanf("%c", &files[i].name);

      printf("Enter the starting block of file %d:", i + 1);

      scanf("%d", &files[i].start_block);

      printf("Enter the no of blocks of file %d:", i + 1);

      scanf("%d", &files[i].no_of_blocks);

      int st = files[i].start_block;

      for (int j = 0; j < files[i].no_of_blocks; j++)
```

```
        {
            blocks[st++] = false;
        }
    }
    char ch;
    getchar();
    printf("Enter the name of file to be searched:");
    scanf("%c", &ch);
    bool found = false;
    for (int i = 0; i < n; i++)
    {
        if (files[i].name == ch)
        {
            printf("File Name      : %c\n", files[i].name);
            printf("Start Block    : %d\n", files[i].start_block);
            printf("No. of Blocks  : %d\n", files[i].no_of_blocks);
            printf("Blocks Occupied: ");
            int st = files[i].start_block;
            for (int j = 0; j < files[i].no_of_blocks; j++)
            {
                printf("%d ", st++);
            }
            found = true;
            break;
        }
    }
    if (!found)
        printf("File not found");
}
```

OUTPUT



```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK9-10> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK9-10\" ; if ($?) { gcc 1.c -o 1 } ; i
f ($?) { .\1 }
Enter the number of files:3
Enter the name of file 1:A
Enter the starting block of file 1:85
Enter the no of blocks of file 1:6
Enter the name of file 2:B
Enter the starting block of file 2:102
Enter the no of blocks of file 2:4
Enter the name of file 3:C
Enter the starting block of file 3:60
Enter the no of blocks of file 3:4
Enter the name of file to be searched:B
File Name      : B
Start Block    : 102
No. of Blocks  : 4
Blocks Occupied: 102 103 104 105
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK9-10> 
```

Program2) Write a program to implement Linked file allocation strategies.

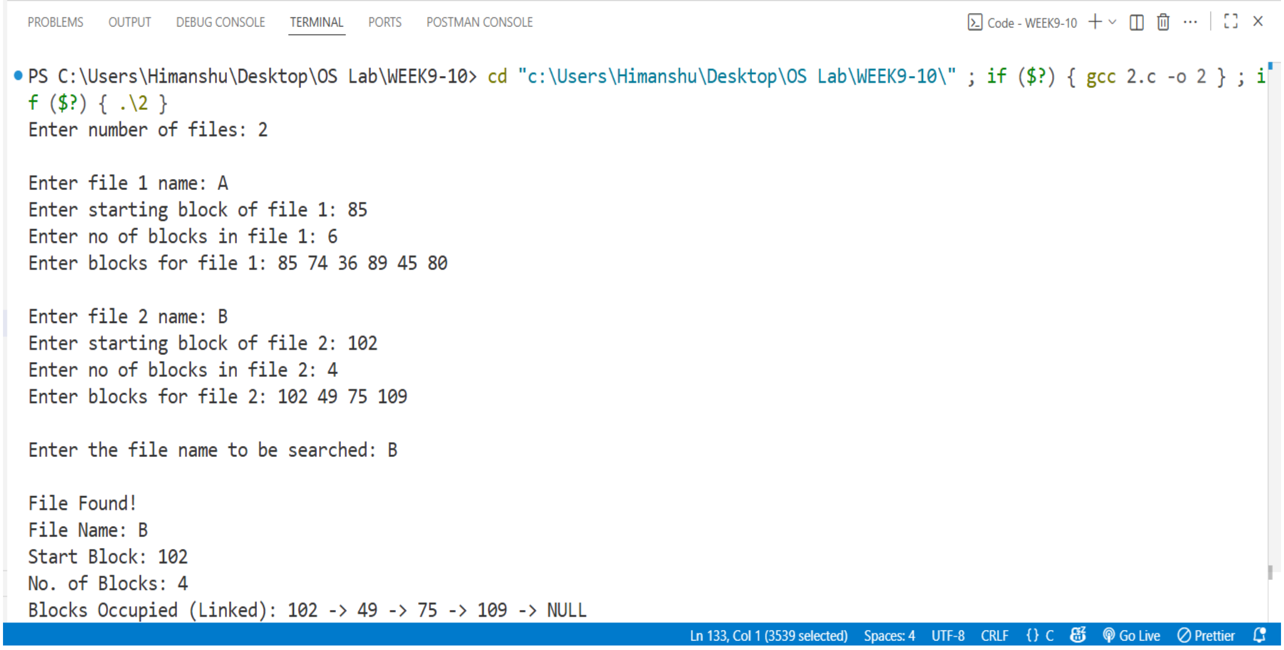
Source Code:

```
#include <stdio.h>
#include <stdbool.h>
typedef struct file{
   char name;
   int start_block;
   int blocks[100];
   int no_of_blocks;
} file;
void main(){
    bool blocks[1000];
   for (int i = 0; i < 1000; ++i)
      blocks[i] = true; // true means free
   int n;
   printf("Enter number of files: ");
   if (scanf("%d", &n) != 1 || n <= 0){
      printf("Invalid number of files.\n");
      return 1;
   }
   file files[n];
   for (int i = 0; i < n; i++)    {
      printf("\nEnter file %d name: ", i + 1);
      if (scanf(" %c", &files[i].name) != 1) {
         printf("Invalid file name input.\n");
         return 1;
      }
      printf("Enter starting block of file %d: ", i + 1);
      if (scanf("%d", &files[i].start_block) != 1)   {
```

```
    printf("Invalid start block input.\n");
    return 1;
  }
  printf("Enter no of blocks in file %d: ", i + 1);
  if (scanf("%d", &files[i].no_of_blocks) != 1 ||
    files[i].no_of_blocks < 0 ||
    files[i].no_of_blocks > 100)  {
    printf("Invalid number of blocks (0..%d).\n", 100);
    return 1;
  }
  if (files[i].no_of_blocks == 0)       {
    printf("No blocks to read for file %c.\n", files[i].name);
    continue;
  }
  printf("Enter blocks for file %d: ", i + 1);
  for (int j = 0; j < files[i].no_of_blocks; j++)       {
    int b;
    while (1)   {
      if (scanf("%d", &b) != 1)              {
        int c;
        while ((c = getchar()) != EOF && c != '\n')
       printf("Invalid input. Enter a valid block number: ");
        continue;
      }
      if (b < 0 || b >= 1000)   {
        printf("Block %d out of range (0..%d). Enter another block: ", b, 1000 - 1);
        continue;
      }
      if (blocks[b] == false)   {
        printf("Block %d already occupied, enter another block: ", b);
```

```
                continue;
            }
            files[i].blocks[j] = b;
            blocks[b] = false; // mark occupied
            break;
        }  } }
    char ch;
    printf("\nEnter the file name to be searched: ");
    if (scanf(" %c", &ch) != 1)    {
        printf("Invalid input.\n");
        return 1;
    }
    bool found = false;
    for (int i = 0; i < n; i++)    {
        if (files[i].name == ch)       {
            printf("\nFile Found!\n");
            printf("File Name: %c\n", files[i].name);
            printf("Start Block: %d\n", files[i].start_block);
            printf("No. of Blocks: %d\n", files[i].no_of_blocks);
            printf("Blocks Occupied (Linked): ");
            for (int j = 0; j < files[i].no_of_blocks; j++)  {
                printf("%d", files[i].blocks[j]);
           }
            printf(" -> NULL\n");
            found = true;
            break;
        }  }
    if (!found)
        printf("\nFile not found\n");
}
```

OUTPUT



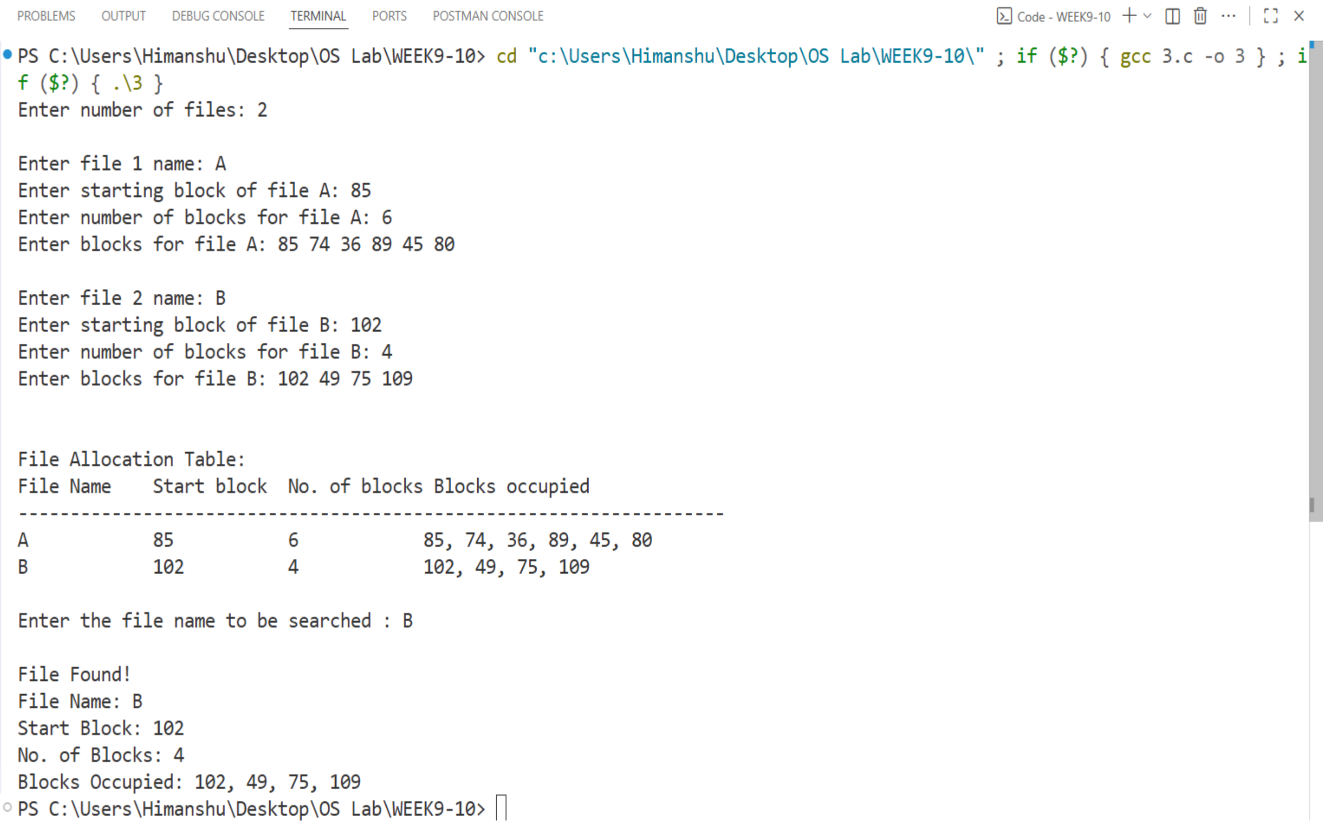
```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK9-10> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK9-10\" ; if ($?) { gcc 2.c -o 2 } ; if ($?) { .\2 }
Enter number of files: 2

Enter file 1 name: A
Enter starting block of file 1: 85
Enter no of blocks in file 1: 6
Enter blocks for file 1: 85 74 36 89 45 80

Enter file 2 name: B
Enter starting block of file 2: 102
Enter no of blocks in file 2: 4
Enter blocks for file 2: 102 49 75 109

Enter the file name to be searched: B

File Found!
File Name: B
Start Block: 102
No. of Blocks: 4
Blocks Occupied (Linked): 102 -> 49 -> 75 -> 109 -> NULL
```

Program3) Write a program to implement Indexed file allocation strategies.

Source Code:

```
#include <stdio.h>

#include <stdbool.h>

struct file {

   char name;

   int start_block;

   int no_of_blocks;

   int flag;

};

struct block {

   int current;

   int next;

};

void main() {

   int n;

   printf("Enter number of files: ");

   scanf("%d", &n);

   struct file files[n];

   struct block sector[1000];

   for (int i = 0; i < 1000; i++)  {

      if (i % 2 == 0) {

         sector[i].current = 100;

         sector[i].next = 100;

      } else {

         sector[i].current = -1;

         sector[i].next = -1;

      } }

   for (int i = 0; i < n; i++)  {
      getchar();
      printf("\nEnter file %d name: ", i + 1);
      scanf("%c", &files[i].name);
      printf("Enter starting block of file %c: ", files[i].name);
      scanf("%d", &files[i].start_block);
      printf("Enter number of blocks for file %c: ", files[i].name);
      scanf("%d", &files[i].no_of_blocks);
   }
   int p = 0;
   for (int i = 0; i < n; i++)    {
      int req = files[i].no_of_blocks;
      int start_block = files[i].start_block;
      int index = -1;
      if (sector[start_block].current == -1)  {
         files[i].flag = 1;
         for (int j = start_block; j < 1000 && req > 0; j++) {
             if (sector[j].current == -1) {
                 sector[j].current = p++; // assign a block number
                 req--;
                 if (index == -1)
                     files[i].start_block = j;
                 else
                     sector[index].next = j;
                 index = j;
             }
         }
      }
      else  {
         printf("enter correct starting block\n");
         files[i].flag = 0;
      }
   }
   printf("\n\nFile Allocation Table:\n");
   printf("File\tStart\tBlocks Linked\n");
   printf("----------------------------------\n");
   for (int i = 0; i < n; i++)    {
      if (!files[i].flag)
         continue;
      printf("%c\t%d\t", files[i].name, files[i].start_block);
      int j = files[i].start_block;
      while (j != -1)       {
         printf("%d ", j);
         j = sector[j].next;
      }
      printf("\n");
   }
}
```

OUTPUT



```
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK9-10> cd "c:\Users\Himanshu\Desktop\OS Lab\WEEK9-10\" ; if ($?) { gcc 3.c -o 3 } ; i
f ($?) { .\3 }
Enter number of files: 2

Enter file 1 name: A
Enter starting block of file A: 85
Enter number of blocks for file A: 6
Enter blocks for file A: 85 74 36 89 45 80

Enter file 2 name: B
Enter starting block of file B: 102
Enter number of blocks for file B: 4
Enter blocks for file B: 102 49 75 109


File Allocation Table:
File Name     Start block  No. of blocks Blocks occupied
--------------------------------------------------------------------
A             85           6             85, 74, 36, 89, 45, 80
B             102          4             102, 49, 75, 109

Enter the file name to be searched : B

File Found!
File Name: B
Start Block: 102
No. of Blocks: 4
Blocks Occupied: 102, 49, 75, 109
PS C:\Users\Himanshu\Desktop\OS Lab\WEEK9-10> 
```