OPERATING SYSTEM LAB FILE

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EXPERIMENT NO-1

System calls & I/O System calls

i) To write programs to perform following operations in UNIX:

a) Process Creation:

In UNIX, a new process can be created using the fork() system call. This creates a new process that is a copy of the calling process, and both processes continue executing from the point of the fork() call.

```
  GNU nano 7.2                              File1.c
#include<stdio.h>
#include<unistd.h>
#include<stdlib.h>

int main(){
    int child = fork();
    sleep(3);
    if (child == 0){
        printf("\t hello from the child class \n");
        printf(" \n");
    } else{
       printf("\t hello from the parent class");
    }
printf("\t currently working in directory: ");
system("pwd");
    return 0;
}
```

b) Executing a command:

To execute a command in UNIX, the system call exec() can be used. This replaces the current process image with a new process image specified by the command.

```
  GNU nano 7.2                              File1.c
#include<stdio.h>
#include<unistd.h>
#include<stdlib.h>

int main(){
    int child = fork();
    sleep(3);
    if (child == 0){
        printf("\t hello from the child class \n");
        printf(" \n");
    } else{
       printf("\t hello from the parent class");
    }
printf("\t currently working in directory: ");
system("pwd");
    return 0;
}
```

c) Sleep command:

The sleep command in UNIX is used to pause the execution of a script or a command for a specified amount of time. The syntax for the command is "sleep n", where n is the number of seconds to sleep.

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

int main(){
    int child = fork();
    sleep(3);
    if (child == 0){
        printf("\t hello from the child class \n");
        printf(" \n");
    } else{
       printf("\t hello from the parent class");
    }
printf("\t currently working in directory: ");
system("pwd");
    return 0;
}
```

d) Sleep command using get pid:

To use the sleep command with the process ID (PID) of a specific process, the command "sleep $(ps -o etime= -p <PID>)" can be used. This retrieves the elapsed time of the specified process and sleeps for that amount of time.

```c
#include<stdio.h>
#include<unistd.h>
#include<stdlib.h>
int main(){
int child = fork();
sleep(10);
if (child==0){
printf("\t hello from the child class (PID: %d) \n", getpid());
printf(" \n");
} else{
printf("\n hello from the parent class (PID: %d)", getpid());
}
system ("pwd");
return 0;
}
```

```
└─$ ./a.out
        hello from parent class (PID: 2774)
        hello from the child class ( PID: 2775)
```

e) Signal handling using kill:

In UNIX, the kill command is used to send a signal to a process. This can be used for signal handling, such as terminating a process or restarting it. The syntax for the command is "kill -<signal> <PID>", where <signal> is the signal to send and <PID> is the process ID of the target process.

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

int main() {
  pid_t pid;

  pid = fork();

  if (pid == 0) {
    // Child process
    printf("Hello from the child process!\n");
  } else {
    // Parent process
    printf("Hello from the parent process!\n");
  }

  return 0;
}
```

```
└$ ./a.out
Hello from the parent process   Hello from the child process
```

f) Wait command:

The wait command in UNIX is used to wait for the completion of a child process. This is useful when a parent process needs to wait for a child process to finish before continuing execution. The syntax for the command is "wait <PID>", where <PID> is the process ID of the child process to wait for.

```c
#include <stdio.h>
#include <unistd.h>
#include <sys/wait.h>
#include <stdlib.h>

int main() {
    pid_t pid;
    int status;

    pid = fork();

    if (pid == 0) {
        printf("Hello from the child process \t");
        exit(0);
    } else if (pid > 0) {
        printf("Hello from the parent process \t");
        wait(&status);
        printf("Child process exited with status %d\n", status);
    } else {
        printf("Fork failed. Child process not created.\n");
        return 1;
    }

    return 0;
}
```

```
└─$ ./a.out
Hello from the child process    Hello from the parent process    Child process ex
ited with status 0
```

ii) To write programs to perform following operations in UNIX:

a) Reading from a file:

In UNIX, the cat command can be used to read the contents of a file. The syntax for the command is "cat <filename>", where <filename> is the name of the file to be read.

```c
#include <stdio.h>

int main() {
    FILE *file;
    char ch;

    file = fopen("example.txt", "r");

    if (file == NULL) {
        perror("Unable to open the file");
        return 1;
    }

    while ((ch = fgetc(file)) != EOF) {
        putchar(ch);
    }

    return 0;
}
```

```
└─$ ./a.out
Unable to open the file: No such file or directory
```

(b) Writing into a file:

In UNIX, the echo command can be used to write text into a file. The syntax for the command is "echo <text> > <filename>", where <text> is the text to be written and <filename> is the name of the file to write to.

```c
#include <stdio.h>

int main() {
    FILE *file;

    file = fopen("output.txt", "w");

    if (file == NULL) {
        perror("Unable to open the file");
        return 1;
    }

    fprintf(file, "This is a line of text written to the file.\n");

    return 0;
}
```

(c) File Creation:

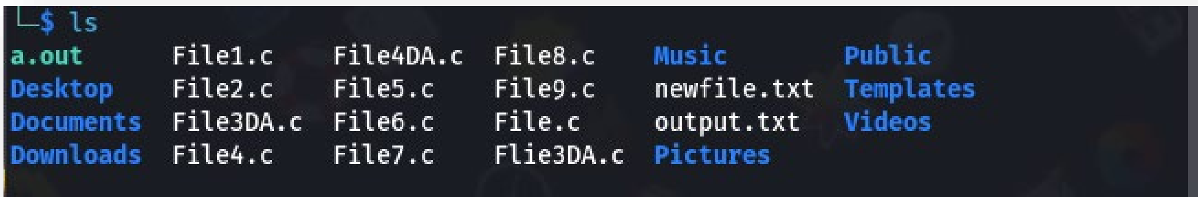
In UNIX, the touch command can be used to create a new file. The syntax for the command is "touch <filename>", where <filename> is the name of the file to be created.

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

int main() {
    int result = creat("newfile.txt", 0644);

    if (result == -1) {
        perror("Unable to create the file");
        return 1;
    }

    return 0;
}
```

```
└─$ gcc File9.c
File9.c: In function ‘main’:
File9.c:6:18: warning: implicit declaration of function ‘creat’ [-Wimplicit-func
tion-declaration]
    6 |     int result = creat("newfile.txt", 0644);
      |                  ^~~~~
```

(d) Implementation of ls command:

The ls command in UNIX is used to list the files and directories in a directory. The syntax for the command is "ls <directory>", where <directory> is the name of the directory to list. The command can be further customized with options such as -l to display the files in a long format and -a to display hidden files.



EXPERIMENT NO-2

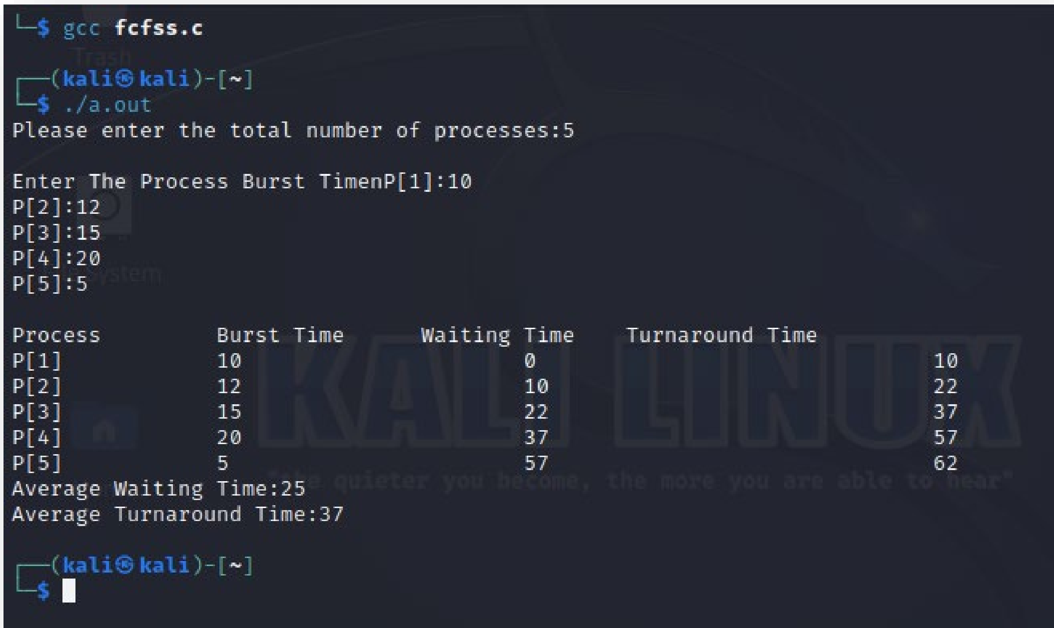
CPU SCHEDULING

1) First come First serve

```
#include<stdio.h>
int main()
{
 int n,bt[30],wait_t[30],turn_ar_t[30],av_wt_t=0,avturn_ar_t=0,i,j;
 printf("Please enter the total number of processes:");
 scanf("%d",&n);
 printf("\nEnter The Process Burst Timen");
 for(i=0;i<n;i++) // burst time for every process will be taken as input
 {
 printf("P[%d]:",i+1);
 scanf("%d",&bt[i]);
 }
 wait_t[0]=0;
 for(i=1;i<n;i++)
 {
 wait_t[i]=0;
 for(j=0;j<i;j++)
 wait_t[i]+=bt[j];
 }
 printf("\nProcess\t\tBurst Time\tWaiting Time\tTurnaround Time");
 for(i=0;i<n;i++)
 {
 turn_ar_t[i]=bt[i]+wait_t[i];
 av_wt_t+=wait_t[i];
 avturn_ar_t+=turn_ar_t[i];
 printf("\nP[%d]\t\t%d\t\t\t%d\t\t\t\t%d",i+1,bt[i],wait_t[i],turn_ar_t[i]);
 }
 av_wt_t/=i;
 avturn_ar_t/=i; // average calculation is done here
```

```
 printf("\nAverage Waiting Time:%d",av_wt_t);
 printf("\nAverage Turnaround Time:%d",avturn_ar_t);
 return 0;
}
```

<u>OUTPUT</u>



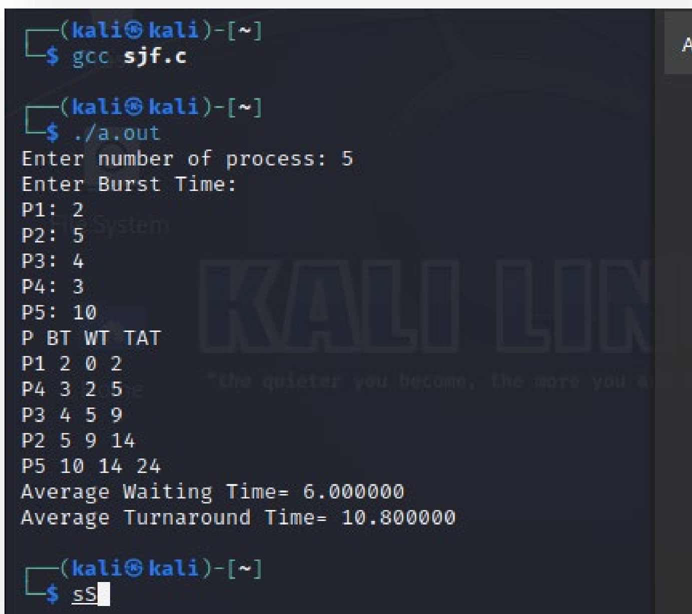
```
└─$ gcc fcfss.c

┌──(kali㉿kali)-[~]
└─$ ./a.out
Please enter the total number of processes:5

Enter The Process Burst TimenP[1]:10
P[2]:12
P[3]:15
P[4]:20
P[5]:5

Process         Burst Time      Waiting Time    Turnaround Time
P[1]            10              0                               10
P[2]            12              10                              22
P[3]            15              22                              37
P[4]            20              37                              57
P[5]            5               57                              62
Average Waiting Time:25
Average Turnaround Time:37

┌──(kali㉿kali)-[~]
└─$ 
```

2) Shortest Job First (SJF)

```
#include <stdio.h>
int main()
{
int A[100][4];
int i, j, n, total = 0, index, temp;
float avg_wt, avg_tat;
printf("Enter number of process: ");
scanf("%d", &n);
printf("Enter Burst Time:\n");
for (i = 0; i < n; i++) {
printf("P%d: ", i + 1);
scanf("%d", &A[i][1]);
A[i][0] = i + 1;
}
for (i = 0; i < n; i++) {
index = i;
for (j = i + 1; j < n; j++)
if (A[j][1] < A[index][1])
index = j;
temp = A[i][1];
A[i][1] = A[index][1];
A[index][1] = temp;
temp = A[i][0];
A[i][0] = A[index][0];
A[index][0] = temp;
}
A[0][2] = 0;
for (i = 1; i < n; i++) {
A[i][2] = 0;
for (j = 0; j < i; j++)
A[i][2] += A[j][1];
total += A[i][2];
}
avg_wt = (float)total / n;
total = 0;
```

```
printf("P BT WT TAT\n");
for (i = 0; i < n; i++) {
A[i][3] = A[i][1] + A[i][2];
total += A[i][3];
printf("P%d %d %d %d\n", A[i][0],
A[i][1], A[i][2], A[i][3]);
}
avg_tat = (float)total / n;
printf("Average Waiting Time= %f", avg_wt);
printf("\nAverage Turnaround Time= %f", avg_tat);
}
```

OUTPUT

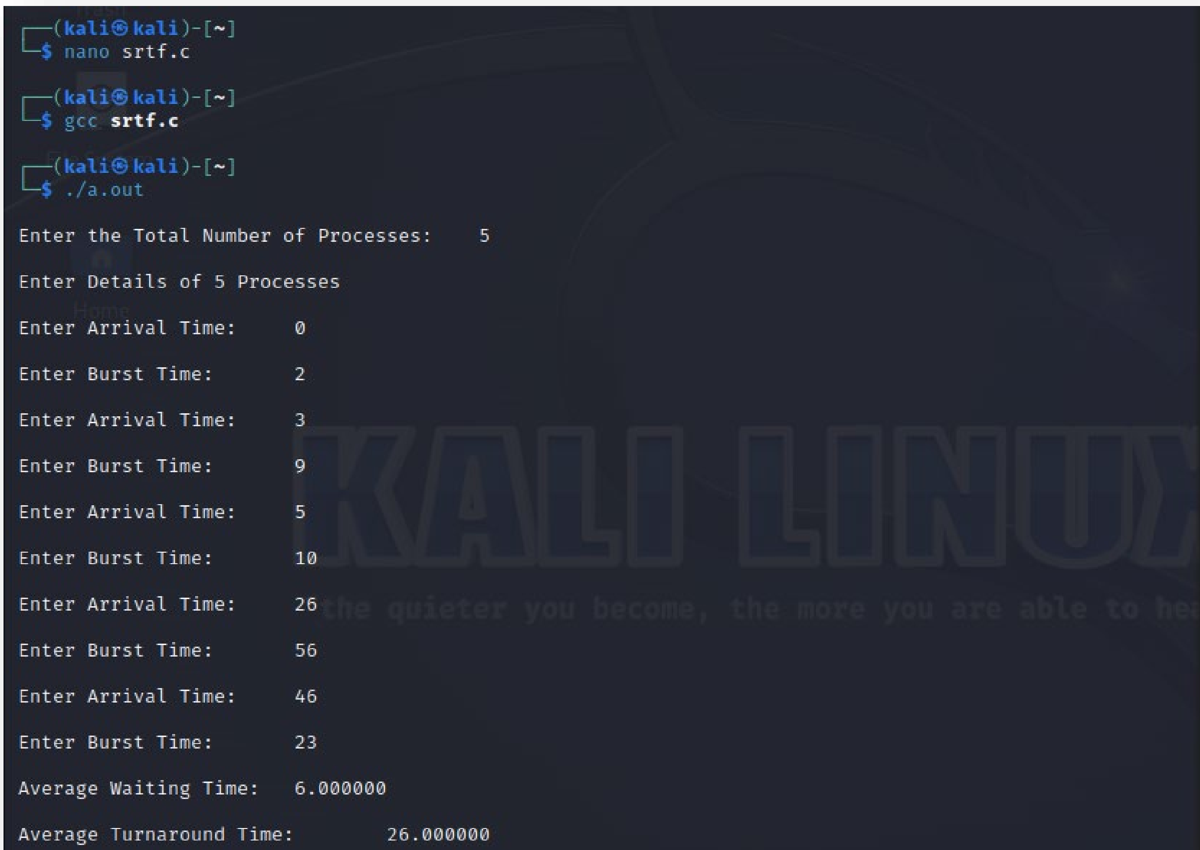


3) Shortest Remaining Time First(SRTF):

```
#include <stdio.h>
int main()
{
int arrival_time[10], burst_time[10], temp[10];
int i, smallest, count = 0, time, limit;
double wait_time = 0, turnaround_time = 0, end;
float average_waiting_time, average_turnaround_time;
printf("\nEnter the Total Number of Processes:\t");
scanf("%d", &limit);
printf("\nEnter Details of %d Processes\n", limit);
for(i = 0; i < limit; i++)
{
printf("\nEnter Arrival Time:\t");
scanf("%d", &arrival_time[i]);
printf("\nEnter Burst Time:\t");
scanf("%d", &burst_time[i]);
temp[i] = burst_time[i];
}
burst_time[9] = 9999;
for(time = 0; count != limit; time++)
{
smallest = 9;
for(i = 0; i < limit; i++)
{
if(arrival_time[i] <= time && burst_time[i] < burst_time[smallest] && burst_time[i] >
0)
{
smallest = i;
}
}
burst_time[smallest]--;
if(burst_time[smallest] == 0)
{
count++;
end = time + 1;
wait_time = wait_time + end - arrival_time[smallest] - temp[smallest];
turnaround_time = turnaround_time + end - arrival_time[smallest];
}
```

```
}
average_waiting_time = wait_time / limit;
average_turnaround_time = turnaround_time / limit;
printf("\nAverage Waiting Time:\t%lf\n", average_waiting_time);
printf("\nAverage Turnaround Time:\t%lf\n", average_turnaround_time);
return 0;
}
```

OUTPUT



4) Priority Scheduling:

```
#include <stdio.h>
#define MAX_PROCESSES 10
struct Process {
 int id;
 int priority;
 int burst_time;
};
void priorityScheduling(struct Process processes[], int n) {
 for (int i = 0; i < n - 1; i++) {
 for (int j = 0; j < n - i - 1; j++) {
 if (processes[j].priority > processes[j + 1].priority) {
 struct Process temp = processes[j];
 processes[j] = processes[j + 1];
 processes[j + 1] = temp;
}}}}
void displaySchedule(struct Process processes[], int n) {
 printf("Process\tPriority\tBurst Time\n");
 for (int i = 0; i < n; i++) {
 printf("%d\t%d\t\t%d\n", processes[i].id, processes[i].priority,
processes[i].burst_time);
 }
}
int main() {
 int n;
 printf("Enter the number of processes: ");
 scanf("%d", &n);
 struct Process processes[MAX_PROCESSES];
 for (int i = 0; i < n; i++) {
 printf("Enter details for process %d\n", i + 1);
 processes[i].id = i + 1;
 printf("Priority: ");
 scanf("%d", &processes[i].priority);
 printf("Burst Time: ");
 scanf("%d", &processes[i].burst_time);
 }
 priorityScheduling(processes, n);
 printf("Priority Schedule:\n");
 displaySchedule(processes, n);
```

```
 return 0;
}
```

OUTPUT

```
┌──(kali㉿kali)-[~]
└─$ nano prority.c

┌──(kali㉿kali)-[~]
└─$ gcc prority.c

┌──(kali㉿kali)-[~]
└─$ ./a.out
Enter the number of processes: 5
Enter details for process 1
Priority: 1
Burst Time: 2
Enter details for process 2
Priority: 3
Burst Time: 4
Enter details for process 3
Priority: 5
Burst Time: 0
Enter details for process 4
Priority: 10
Burst Time: 20
Enter details for process 5
Priority: 30
Burst Time: 40
Priority Schedule:
Process Priority        Burst Time
1       1               2
2       3               4
3       5               0
4       10              20
5       30              40
```

EXPERIMENT NO-3

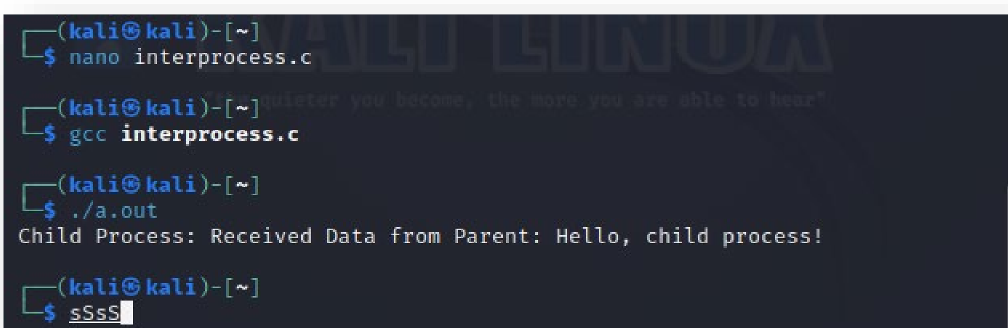
Inter-process Communication

Q - Write a program that creates a child process. Parent process writes data to pipe and child process reads the data from pipe and prints it on the screen.

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>
#include <sys/wait.h>
int main() {
    int pipe_fd[2];
    pid_t pid;
    if (pipe(pipe_fd) == -1) {
        perror("Pipe creation failed");
        exit(EXIT_FAILURE);
    }
    pid = fork();
    if (pid == -1) {
        perror("Fork failed");
        exit(EXIT_FAILURE);
    }
    if (pid == 0) {
        close(pipe_fd[1]);
        char buffer[1024];
        int bytes_read;
```

```
        bytes_read = read(pipe_fd[0], buffer, sizeof(buffer));
        if (bytes_read == -1) {
            perror("Read from pipe failed");
            exit(EXIT_FAILURE);
        }
        printf("Child Process: Received Data from Parent: %s\n", buffer);
        close(pipe_fd[0]);
        exit(EXIT_SUCCESS);
    } else {
        close(pipe_fd[0]);
        char data[] = "Hello, child process!";
        if (write(pipe_fd[1], data, strlen(data) + 1) == -1) {
            perror("Write to pipe failed");
            exit(EXIT_FAILURE);
        }
        close(pipe_fd[1]);
        wait(NULL);
        exit(EXIT_SUCCESS);
    }
}
```

OUTPUT



EXPERIMENT NO-4

SEMAPHORES

(i) Write a program that demonstrates how two processes can share a variable using semaphore

```
#include<pthread.h>

#include<stdio.h>

#include<semaphore.h>

#include<unistd.h>

void *fun1();

 void *fun2();

 int shared=1; //shared variable

 sem_t s; //semaphore variable

 int main()

 {

 sem_init(&s,0,1); //initialize semaphore variable - 1st argument is address of variable, 2nd is number of
processes sharing semaphore, 3rd argument is the initial value of semaphore variable

 pthread_t thread1, thread2;

 pthread_create(&thread1, NULL, fun1, NULL);

 pthread_create(&thread2, NULL, fun2, NULL);

 pthread_join(thread1, NULL);

 pthread_join(thread2,NULL);

 printf("Final value of shared is %d\n",shared); //prints the last updated value of shared variable

 }

void *fun1()

{

   int x;

   sem_wait(&s); //executes wait operation on s
```

```
    x=shared;//thread1 reads value of shared variable
    printf("Thread1 reads the value as %d\n",x);
    x++;  //thread1 increments its value
    printf("Local updation by Thread1: %d\n",x);
    sleep(1); //thread1 is preempted by thread 2
    shared=x; //thread one updates the value of shared variable
    printf("Value of shared variable updated by Thread1 is: %d\n",shared);
    sem_post(&s);
}
void *fun2()
{
    int y;
    sem_wait(&s);
    y=shared;//thread2 reads value of shared variable
    printf("Thread2 reads the value as %d\n",y);
    y--;  //thread2 increments its value
    printf("Local updation by Thread2: %d\n",y);
    sleep(1); //thread2 is preempted by thread 1
    shared=y; //thread2 updates the value of shared variable
    printf("Value of shared variable updated by Thread2 is: %d\n",shared);
    sem_post(&s);
}
```

OUTPUT

```
┌──(kali㉿kali)-[~]
└─$ nano twoprocess.c

┌──(kali㉿kali)-[~]
└─$ gcc twoprocess.c

┌──(kali㉿kali)-[~]
└─$ ./a.out
Thread1 reads the value as 1
Local updation by Thread1: 2
Value of shared variable updated by Thread1 is: 2
Thread2 reads the value as 2
Local updation by Thread2: 1
Value of shared variable updated by Thread2 is: 1
Final value of shared is 1
```

(ii)To write a C program to implement the Producer & consumer Problem (Semaphore)

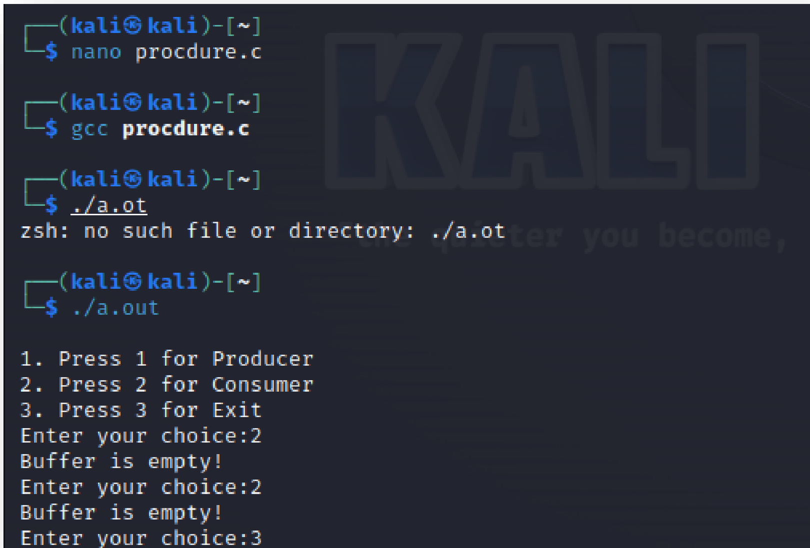
```
#include <stdio.h>

#include <stdlib.h>

// Initialize a mutex to 1

int mutex = 1;

// Number of full slots as 0

int full = 0;

// Number of empty slots as size

// of buffer

int empty = 10, x = 0;

// Function to produce an item and

// add it to the buffer

void producer()

{

        // Decrease mutex value by 1

        --mutex;

        // Increase the number of full

        // slots by 1

        ++full;

        // Decrease the number of empty

        // slots by 1

        --empty;

        // Item produced

        x++;

        printf("\nProducer produces"

                "item %d",

                x);
```

```
        // Increase mutex value by 1
        ++mutex;
}
// Function to consume an item and
// remove it from buffer
void consumer()
{
        // Decrease mutex value by 1
        --mutex;
        // Decrease the number of full
        // slots by 1
        --full;
        // Increase the number of empty
        // slots by 1
        ++empty;
        printf("\nConsumer consumes "
                "item %d",
                x);
        x--;
        // Increase mutex value by 1
        ++mutex;
}
// Driver Code
int main()
{
        int n, i;
        printf("\n1. Press 1 for Producer"
                "\n2. Press 2 for Consumer"
                "\n3. Press 3 for Exit");
```

```
// Using '#pragma omp parallel for'
// can give wrong value due to
// synchronization issues.
// 'critical' specifies that code is
// executed by only one thread at a
// time i.e., only one thread enters
// the critical section at a given time
#pragma omp critical
    for (i = 1; i > 0; i++) {
     printf("\nEnter your choice:");
        scanf("%d", &n);
        // Switch Cases
        switch (n) {
        case 1:
            // If mutex is 1 and empty
            // is non-zero, then it is
            // possible to produce
            if ((mutex == 1)
                && (empty != 0)) {
                producer();
            }
            // Otherwise, print buffer
            // is full
            else {
                printf("Buffer is full!");
            }
            break;
        case 2:
            // If mutex is 1 and full
```

```
                // is non-zero, then it is
                // possible to consume
                if ((mutex == 1)
                    && (full != 0)) {
                    consumer();
                }
                // Otherwise, print Buffer
                // is empty
                else {
                    printf("Buffer is empty!");
                }
                break;
            // Exit Condition
            case 3:
                exit(0);
                break;
            }
        }
    }
```

OUTPUT


┌──(kali㉿kali)-[~]
└─$ nano procdure.c
┌──(kali㉿kali)-[~]
└─$ gcc procdure.c
┌──(kali㉿kali)-[~]
└─$ ./a.ot
zsh: no such file or directory: ./a.ot
┌──(kali㉿kali)-[~]
└─$ ./a.out
1. Press 1 for Producer
2. Press 2 for Consumer
3. Press 3 for Exit
Enter your choice:2
Buffer is empty!
Enter your choice:2
Buffer is empty!
Enter your choice:3

EXPERIMENT NO-5

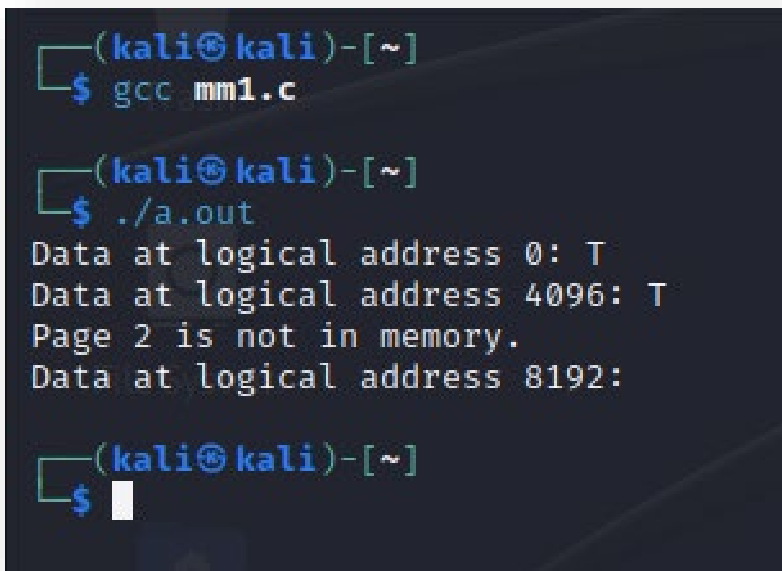
Memory management-1

```
#include <stdio.h>
#include <stdlib.h>
#define PAGE_SIZE 4096
#define NUM_PAGES 256
#define MEMORY_SIZE (PAGE_SIZE * NUM_PAGES)
// Page table entry structure
typedef struct {
 int valid;       // Flag indicating if the page is in memory (1) or not (0)
 int frame_number;  // Frame number where the page is stored
} PageTableEntry;
// Physical memory (frames)
char physical_memory[MEMORY_SIZE];
// Page table
PageTableEntry page_table[NUM_PAGES];
// Function to allocate a page
int allocate_page() {
    for (int i = 0; i < NUM_PAGES; i++) {
        if (page_table[i].valid == 0) {
            page_table[i].valid = 1;
            return i;
        }
    }
    return -1;  // No available pages
}
// Function to load data into a page
```

```
void load_page(int page_number, char* data) {
    if (page_number >= 0 && page_number < NUM_PAGES) {
        int frame_start = page_number * PAGE_SIZE;
        for (int i = 0; i < PAGE_SIZE; i++) {
            physical_memory[frame_start + i] = data[i];
        }
        page_table[page_number].frame_number = frame_start;
    }
}
// Function to access memory
char access_memory(int logical_address) {
    int page_number = logical_address / PAGE_SIZE;
    int offset = logical_address % PAGE_SIZE;
    if (page_table[page_number].valid == 1) {
        int frame_start = page_table[page_number].frame_number;
        return physical_memory[frame_start + offset];
    } else {
        printf("Page %d is not in memory.\n", page_number);
        return '\0';
    }
}
int main() {
    // Initialize page table entries
    for (int i = 0; i < NUM_PAGES; i++) {
        page_table[i].valid = 0;
    }
    // Allocate and load pages
    int page1 = allocate_page();
    int page2 = allocate_page();
```

```
    char data1[PAGE_SIZE] = "This is page 1.";
    char data2[PAGE_SIZE] = "This is page 2.";
    load_page(page1, data1);
    load_page(page2, data2);
    // Access memory
    printf("Data at logical address 0: %c\n", access_memory(0));
    printf("Data at logical address 4096: %c\n", access_memory(4096));
    printf("Data at logical address 8192: %c\n", access_memory(8192));
    return 0;
}
```

OUTPUT



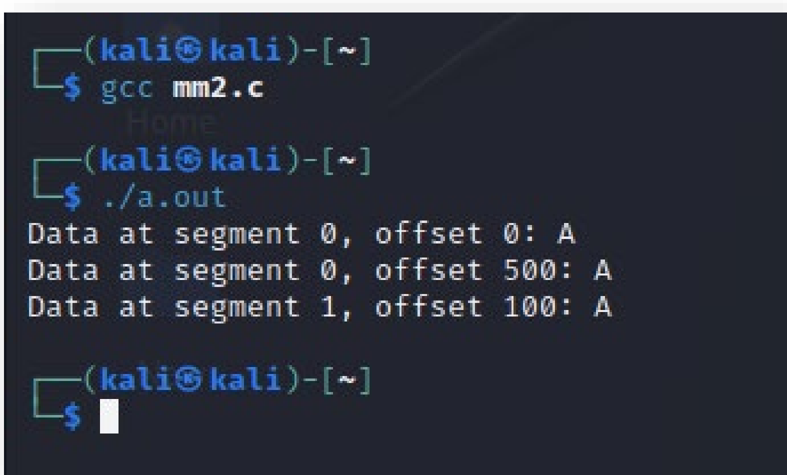
EXPERIMENT NO-6

Memory management-2

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

#define MAX_SEGMENTS 10

// Segment table entry structure
typedef struct {
    int base_address; // Base address of the segment
    int size;         // Size of the segment
} SegmentTableEntry;

// Segment table
SegmentTableEntry segment_table[MAX_SEGMENTS];

// Function to allocate a segment
int allocate_segment(int size) {
    for (int i = 0; i < MAX_SEGMENTS; i++) {
        if (segment_table[i].size == 0) {
            segment_table[i].base_address = rand() % 10000; // Assign a random base address (for simplicity)
            segment_table[i].size = size;
            return i;
        }
    }
    return -1; // No available segments
}

// Function to access memory
char access_memory(int segment_number, int offset) {
    if (segment_number >= 0 && segment_number < MAX_SEGMENTS) {
        int base_address = segment_table[segment_number].base_address;
        int size = segment_table[segment_number].size;

        if (offset >= 0 && offset < size) {
            // You can access memory within the segment's size here
            // For simplicity, we're returning a character 'A' as data
```

```
            return 'A';
        }
    }
    printf("Segment %d is invalid or offset is out of bounds.\n", segment_number);
    return '\0';
}

int main() {
    // Initialize segment table entries
    for (int i = 0; i < MAX_SEGMENTS; i++) {
        segment_table[i].base_address = 0;
        segment_table[i].size = 0;
    }
    // Allocate segments
    int segment1 = allocate_segment(1000);
    int segment2 = allocate_segment(500);
    // Access memory within the allocated segments
    printf("Data at segment %d, offset 0: %c\n", segment1, access_memory(segment1, 0));
    printf("Data at segment %d, offset 500: %c\n", segment1, access_memory(segment1, 500));
    printf("Data at segment %d, offset 100: %c\n", segment2, access_memory(segment2, 100));

    return 0;
}
```

OUTPUT



EXPERIMENT NO-7

FILE MANIPULATION

i) Write a program that displays all the files and directories.

```
#include <stdio.h>
#include <dirent.h>
int main(void)
{
    struct dirent *de;  // Pointer for directory entry
    // opendir() returns a pointer of DIR type.
    DIR *dr = opendir(".");
    if (dr == NULL)  // opendir returns NULL if couldn't open directory
    {
        printf("Could not open current directory" );
        return 0;
    }
    // Refer http://pubs.opengroup.org/onlinepubs/7990989775/xsh/readdir.html
    // for readdir()
    while ((de = readdir(dr)) != NULL)
            printf("%s\n", de->d_name);
    closedir(dr);
    return 0;
}
```

OUTPUT

```
.vboxclient-display-svga-x11-tty7-control.pid
mm1.c
.vboxclient-vmsvga-session-tty7-control.pid
.gnupg
.face
..
.
Desktop
.vboxclient-draganddrop-tty7-control.pid
.ICEauthority
twoprocess.c
.zshrc
.zsh_history
fcfss.c
.vboxclient-hostversion-tty7-control.pid
.Xauthority
Pictures
fcfs.c
.profile
diningphilospher.c.save
diningphilospher.c.save.1
.vboxclient-display-svga-x11-tty7-service.pid
.bashrc.original
.cache
.vboxclient-clipboard-tty7-service.pid
Templates
.vboxclient-seamless-tty7-control.pid
sjf.c
.vboxclient-seamless-tty7-service.pid
.face.icon
Public
upes capture.pcapng
.bashrc
Downloads
Documents
procdure.c
Music
filemanipulation.c
.sudo_as_admin_successful
srtf.c
.xsession-errors.old
.bash_logout
.xsession-errors
prority.c
.config
.dmrc
interprocess.c
```

ii) Write a program to create new directory.

```
// C program to create a directory
// using mkdir() function
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
int main()
{
    char dirName[16];
    int ret = 0;
    printf("Enter directory name: ");
    scanf("%s", dirName);

    ret = mkdir(dirName, 0755);

    if (ret == 0)
        printf("Directory created successfully\n");
    else
        printf("Unable to create directory %s\n", dirName);

    return 0;
}
```

OUTPUT

```
┌──(kali㉿kali)-[~]
└─$ ./a.out
Enter directory name: Pulkit
Directory created successfully

┌──(kali㉿kali)-[~]
└─$ 
```

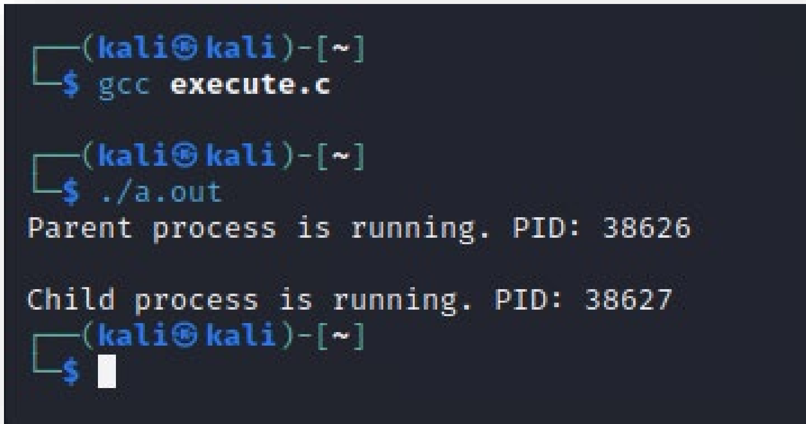
EXPERIMENT NO-8

Fork Execution

1) Simple fork execution

```
#include <stdio.h>

#include <unistd.h>


int main() {

    pid_t child_pid;


    child_pid = fork();


    if (child_pid == -1) {

        perror("Fork failed");

        return 1;

    }


    if (child_pid == 0) {

        printf("Child process is running. PID: %d\n", getpid());

    } else {

        printf("Parent process is running. PID: %d\n", getpid());

    }

    return 0;

}
```

OUTPUT

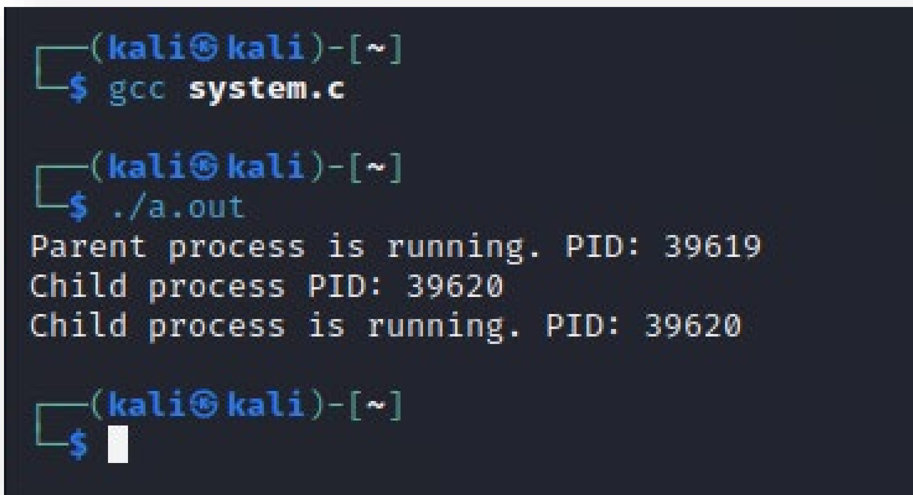


2) fork system call

```
#include <stdio.h>

#include <unistd.h>


int main() {

  pid_t child_pid;


  child_pid = fork();


  if (child_pid == -1) {

    perror("Fork failed");

    return 1;

  }


  if (child_pid == 0) {

    printf("Child process is running. PID: %d\n", getpid());
```

```
    } else {
        printf("Parent process is running. PID: %d\n", getpid());
        printf("Child process PID: %d\n", child_pid);
    }

    return 0;
}
```

<u>OUTPUT</u>



EXPERIMENT NO-9 & 10

IMPLEMENTATION OF BANKER'S AND DINING PHILOSPHER'S ALGORITHM

1) Write a program to implement banker's algorithm.

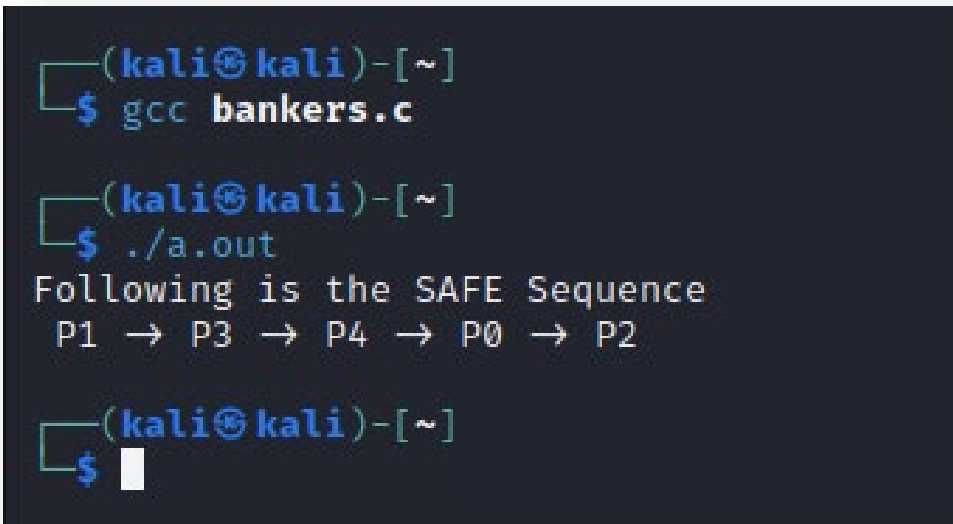
```
 // Banker's Algorithm
#include <stdio.h>
int main()
{
   // P0, P1, P2, P3, P4 are the Process names here
   int n, m, i, j, k;
   n = 5;                    // Number of processes
   m = 3;                     // Number of resources
   int alloc[5][3] = {{0, 1, 0},  // P0 // Allocation Matrix
                   {2, 0, 0},  // P1
                   {3, 0, 2},  // P2
                   {2, 1, 1},  // P3
                   {0, 0, 2}}; // P4
   int max[5][3] = {{7, 5, 3},  // P0 // MAX Matrix
                 {3, 2, 2},  // P1
                 {9, 0, 2},  // P2
                 {2, 2, 2},  // P3
                 {4, 3, 3}}; // P4
```

```
int avail[3] = {3, 3, 2}; // Available Resources

int f[n], ans[n], ind = 0;
for (k = 0; k < n; k++)
{
    f[k] = 0;
}
int need[n][m];
for (i = 0; i < n; i++)
{
    for (j = 0; j < m; j++)
        need[i][j] = max[i][j] - alloc[i][j];
}
int y = 0;
for (k = 0; k < 5; k++)
{
    for (i = 0; i < n; i++)
    {
        if (f[i] == 0)
        {
            int flag = 0;
            for (j = 0; j < m; j++)
            {
                if (need[i][j] > avail[j])
                {
                    flag = 1;
```

```
                    break;
                }
            }
            if (flag == 0)
            {
                ans[ind++] = i;
                for (y = 0; y < m; y++)
                    avail[y] += alloc[i][y];
                f[i] = 1;
            }
        }
    }
}
int flag = 1;
for (int i = 0; i < n; i++)
{
    if (f[i] == 0)
    {
        flag = 0;
        printf("The following system is not safe");
        break;
    }
}
if (flag == 1)
{
    printf("Following is the SAFE Sequence\n");
    for (i = 0; i < n - 1; i++)
```

```
            printf(" P%d ->", ans[i]);

        printf(" P%d", ans[n - 1]);

    }

    return (0);

}
```

<u>OUTPUT</u>



2) Write a program to implement Dining Philospher's algorithm.

```
#include<stdio.h>

#include<stdlib.h>

#include<pthread.h>

#include<semaphore.h>

#include<unistd.h>


sem_t room;

sem_t chopstick[5];

void * philosopher(void *);

void eat(int);

int main()

{

        int i,a[5];

        pthread_t tid[5];


        sem_init(&room,0,4);


        for(i=0;i<5;i++)

                sem_init(&chopstick[i],0,1);


        for(i=0;i<5;i++){

                a[i]=i;

                pthread_create(&tid[i],NULL,philosopher,(void *)&a[i]);

        }
```

```
	for(i=0;i<5;i++)
		pthread_join(tid[i],NULL);
}

void * philosopher(void * num)
{
	int phil=*(int *)num;

	sem_wait(&room);
	printf("\nPhilosopher %d has entered room",phil);
	sem_wait(&chopstick[phil]);
	sem_wait(&chopstick[(phil+1)%5]);

	eat(phil);
	sleep(2);
	printf("\nPhilosopher %d has finished eating",phil);

	sem_post(&chopstick[(phil+1)%5]);
	sem_post(&chopstick[phil]);
	sem_post(&room);
}

void eat(int phil)
{
	printf("\nPhilosopher %d is eating",phil);
}
```

OUTPUT

```
┌──(kali㉿kali)-[~]
└─$ gcc dining.c

┌──(kali㉿kali)-[~]
└─$ ./a.out

Philosopher 0 has entered room
Philosopher 0 is eating
Philosopher 2 has entered room
Philosopher 2 is eating
Philosopher 3 has entered room
Philosopher 1 has entered room
Philosopher 2 has finished eating
Philosopher 0 has finished eating
Philosopher 3 is eating
Philosopher 4 has entered room
Philosopher 1 is eating
Philosopher 3 has finished eating
Philosopher 1 has finished eating
Philosopher 4 is eating
Philosopher 4 has finished eating

┌──(kali㉿kali)-[~]
└─$ 
```