**LIST OF PROGRAMS**

**1.Create a new process by invoking the appropriate system call. Get the process identifier of the currently running process and its respective parent using system calls and display the same using a C program.**

#include<stdio.h>

#include<unistd.h>

int main()

{

printf("Process ID: %d\n", getpid() );

printf("Parent Process ID: %d\n", getpid() );

return 0;

}

**2. Identify the system calls to copy the content of one file to another and illustrate the same using a C program.**

#include <stdio.h>

#include <stdlib.h>

int main()

{

FILE \*fptr1, \*fptr2;

char filename[100], c;

printf("Enter the filename to open for reading \n");

scanf("%s", filename);

fptr1 = fopen(filename, "r");

if (fptr1 == NULL)

{

printf("Cannot open file %s \n", filename);

exit(0);

}

printf("Enter the filename to open for writing \n");

scanf("%s", filename);

fptr2 = fopen(filename, "w");

if (fptr2 == NULL)

{

printf("Cannot open file %s \n", filename);

exit(0);

}

c = fgetc(fptr1);

while (c != EOF)

{

fputc(c, fptr2);

c = fgetc(fptr1);

}

printf("\nContents copied to %s", filename);

fclose(fptr1);

fclose(fptr2);

return 0;

}

**3. Design a CPU scheduling program with C using First Come First Served technique with the following considerations.**

**a. All processes are activated at time 0.**

**b. Assume that no process waits on I/O devices.**

#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);

}

**4. Construct a scheduling program with C that selects the waiting process with the smallest execution time to execute next.**

#include<stdio.h>

int main()

{

int bt[20],p[20],wt[20],tat[20],i,j,n,total=0,pos,temp;

float avg\_wt,avg\_tat;

printf("Enter number of process:");

scanf("%d",&n);

printf("nEnter Burst Time:n");

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

{

printf("p%d:",i+1);

scanf("%d",&bt[i]);

p[i]=i+1;

}

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

{

pos=i;

for(j=i+1;j<n;j++)

{

if(bt[j]<bt[pos])

pos=j;

}

temp=bt[i];

bt[i]=bt[pos];

bt[pos]=temp;

temp=p[i];

p[i]=p[pos];

p[pos]=temp;

}

wt[0]=0;

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

{

wt[i]=0;

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

wt[i]+=bt[j];

total+=wt[i];

}

avg\_wt=(float)total/n;

total=0;

printf("nProcesst Burst Time tWaiting TimetTurnaround Time");

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

{

tat[i]=bt[i]+wt[i];

total+=tat[i];

printf("np%dtt %dtt %dttt%d",p[i],bt[i],wt[i],tat[i]);

}

avg\_tat=(float)total/n;

printf("nnAverage Waiting Time=%f",avg\_wt);

printf("nAverage Turnaround Time=%fn",avg\_tat);

}

**5. Construct a scheduling program with C that selects the waiting process with the highest priority to execute next.**

#include<stdio.h>

struct priority\_scheduling {

char process\_name;

int burst\_time;

int waiting\_time;

int turn\_around\_time;

int priority;

};

int main() {

int number\_of\_process;

int total = 0;

struct priority\_scheduling temp\_process;

int ASCII\_number = 65;

int position;

float average\_waiting\_time;

float average\_turnaround\_time;

printf("Enter the total number of Processes: ");

scanf("%d", & number\_of\_process);

struct priority\_scheduling process[number\_of\_process];

printf("\nPlease Enter the Burst Time and Priority of each process:\n");

for (int i = 0; i < number\_of\_process; i++) {

process[i].process\_name = (char) ASCII\_number;

printf("\nEnter the details of the process %c \n", process[i].process\_name);

printf("Enter the burst time: ");

scanf("%d", & process[i].burst\_time);

printf("Enter the priority: ");

scanf("%d", & process[i].priority);

ASCII\_number++;

}

for (int i = 0; i < number\_of\_process; i++) {

position = i;

for (int j = i + 1; j < number\_of\_process; j++) {

if (process[j].priority > process[position].priority)

position = j;

}

temp\_process = process[i];

process[i] = process[position];

process[position] = temp\_process;

}

process[0].waiting\_time = 0;

for (int i = 1; i < number\_of\_process; i++) {

process[i].waiting\_time = 0;

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

process[i].waiting\_time += process[j].burst\_time;

}

total += process[i].waiting\_time;

}

average\_waiting\_time = (float) total / (float) number\_of\_process;

total = 0;

printf("\n\nProcess\_name \t Burst Time \t Waiting Time \t Turnaround Time\n");

printf("------------------------------------------------------------\n");

for (int i = 0; i < number\_of\_process; i++) {

process[i].turn\_around\_time = process[i].burst\_time + process[i].waiting\_time;

total += process[i].turn\_around\_time;

printf("\t %c \t\t %d \t\t %d \t\t %d", process[i].process\_name, process[i].burst\_time, process[i].waiting\_time, process[i].turn\_around\_time);

printf("\n-----------------------------------------------------------\n");

}

average\_turnaround\_time = (float) total / (float) number\_of\_process;

printf("\n\n Average Waiting Time : %f", average\_waiting\_time);

printf("\n Average Turnaround Time: %f\n", average\_turnaround\_time);

return 0;

}

**6. Construct a C program to simulate Round Robin scheduling algorithm with C.**

#include<stdio.h>

#include<conio.h>

int main()

{

int i, NOP, sum=0,count=0, y, quant, wt=0, tat=0, at[10], bt[10], temp[10];

float avg\_wt, avg\_tat;

printf(" Total number of process in the system: ");

scanf("%d", &NOP);

y = NOP;

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

{

printf("\n Enter the Arrival and Burst time of the Process[%d]\n", i+1);

printf(" Arrival time is: \t");

scanf("%d", &at[i]);

printf(" \nBurst time is: \t");

scanf("%d", &bt[i]);

temp[i] = bt[i];

}

printf("Enter the Time Quantum for the process: \t");

scanf("%d", &quant);

printf("\n Process No \t\t Burst Time \t\t TAT \t\t Waiting Time ");

for(sum=0, i = 0; y!=0; )

{

if(temp[i] <= quant && temp[i] > 0)

{

sum = sum + temp[i];

temp[i] = 0;

count=1;

}

else if(temp[i] > 0)

{

temp[i] = temp[i] - quant;

sum = sum + quant;

}

if(temp[i]==0 && count==1)

{

y--;

printf("\nProcess No[%d] \t\t %d\t\t\t\t %d\t\t\t %d", i+1, bt[i], sum-at[i], sum-at[i]-bt[i]);

wt = wt+sum-at[i]-bt[i];

tat = tat+sum-at[i];

count =0;

}

if(i==NOP-1)

{

i=0;

}

else if(at[i+1]<=sum)

{

i++;

}

else

{

i=0;

}

}

avg\_wt = wt \* 1.0/NOP;

avg\_tat = tat \* 1.0/NOP;

printf("\n Average Turn Around Time: \t%f", avg\_wt);

printf("\n Average Waiting Time: \t%f", avg\_tat);

getch();

}

**7. Illustrate the concept of inter-process communication using shared memory with a C program.**

#include<stdio.h>

#include<stdlib.h>

#include<unistd.h>

#include<sys/shm.h>

#include<string.h>

int main()

{

int i;

void \*shared\_memory;

char buff[100];

int shmid;

shmid=shmget((key\_t)2345, 1024, 0666|IPC\_CREAT);

printf("Key of shared memory is %d\n",shmid);

shared\_memory=shmat(shmid,NULL,0);

printf("Process attached at %p\n",shared\_memory);

printf("Enter some data to write to shared memory\n");

read(0,buff,100);

strcpy(shared\_memory,buff);

printf("You wrote : %s\n",(char \*)shared\_memory);

}

**8. Illustrate the concept of multithreading using a C program.**

#include<stdio.h>

#include<stdlib.h>

#include<unistd.h>

#include<pthread.h>

void \*myThreadFun(void \*vargp)

{

sleep(1);

printf("Printing GeeksQuiz from Thread \n");

return NULL;

}

int main()

{

pthread\_t thread\_id;

printf("Before Thread\n");

pthread\_create(&thread\_id, NULL, myThreadFun, NULL);

pthread\_join(thread\_id, NULL);

printf("After Thread\n");

exit(0);

}

**9. Design a C program to simulate the concept of Dining-Philosophers problem**

#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);

}

**10. Construct a C program for implementation of memory allocation using first fit strategy.**

#include<stdio.h>

int main()

{

int bsize[10], psize[10], bno, pno, flags[10], allocation[10], i, j;

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

{

flags[i] = 0;

allocation[i] = -1;

}

printf("Enter no. of blocks: ");

scanf("%d", &bno);

printf("\nEnter size of each block: ");

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

scanf("%d", &bsize[i]);

printf("\nEnter no. of processes: ");

scanf("%d", &pno);

printf("\nEnter size of each process: ");

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

scanf("%d", &psize[i]);

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

for(j = 0; j < bno; j++)

if(flags[j] == 0 && bsize[j] >= psize[i])

{

allocation[j] = i;

flags[j] = 1;

break;

}

printf("\nBlock no.\tsize\t\tprocess no.\t\tsize");

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

{

printf("\n%d\t\t%d\t\t", i+1, bsize[i]);

if(flags[i] == 1)

printf("%d\t\t\t%d",allocation[i]+1,psize[allocation[i]]);

else

printf("Not allocated");

}

}

**11. Construct a C program to organize the file using single-level directory.**

#include<stdio.h>

#include<conio.h>

#include<string.h>

int main()

{

int nf=0,i=0,j=0,ch;

char mdname[10],fname[10][10],name[10];

printf("Enter the directory name:");

scanf("%s",mdname);

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

scanf("%d",&nf);

do

{

printf("Enter file name to be created:");

scanf("%s",name);

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

{

if(!strcmp(name,fname[i]))

break;

}

if(i==nf)

{

strcpy(fname[j++],name);

nf++;

}

else

printf("There is already %s\n",name);

printf("Do you want to enter another file(yes - 1 or no - 0):");

scanf("%d",&ch);

}

while(ch==1);

printf("Directory name is:%s\n",mdname);

printf("Files names are:");

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

printf("\n%s",fname[i]);

getch();

}

**12. Design a C program to organize the file using two level directory structure.**

#include<stdio.h>

#include<conio.h>

struct st

{

char dname[10];

char sdname[10][10];

char fname[10][10][10];

int ds,sds[10];

}dir[10];

int main()

{

int i,j,k,n;

printf("enter number of directories:");

scanf("%d",&n);

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

{

printf("enter directory %d names:",i+1);

scanf("%s",&dir[i].dname);

printf("enter size of directories:");

scanf("%d",&dir[i].ds);

for(j=0;j<dir[i].ds;j++)

{

printf("enter subdirectory name and size:");

scanf("%s",&dir[i].sdname[j]);

scanf("%d",&dir[i].sds[j]);

for(k=0;k<dir[i].sds[j];k++)

{

printf("enter file name:");

scanf("%s",&dir[i].fname[j][k]);

}

}

}

printf("\ndirname\t\tsize\tsubdirname\tsize\tfiles");

printf("\n\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

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

{

printf("%s\t\t%d",dir[i].dname,dir[i].ds);

for(j=0;j<dir[i].ds;j++)

{

printf("\t%s\t\t%d\t",dir[i].sdname[j],dir[i].sds[j]);

for(k=0;k<dir[i].sds[j];k++)

printf("%s\t",dir[i].fname[j][k]);

printf("\n\t\t");

}

printf("\n");

}

getch();

}

**13. Develop a C program for implementing random access file for processing the employee details.**

**14. Illustrate the deadlock avoidance concept by simulating Banker’s algorithm with C.**

#include<stdio.h>

#include<conio.h>

int max[100][100];

int alloc[100][100];

int need[100][100];

int avail[100];

int n,r;

void input();

void show();

void cal();

int main()

{

int i,j;

printf("\*\*\*\*\*\*\*\*\*\* Banker's Algo \*\*\*\*\*\*\*\*\*\*\*\*\n");

input();

show();

cal();

getch();

return 0;

}

void input()

{

int i,j;

printf("Enter the no of Processes\t");

scanf("%d",&n);

printf("Enter the no of resources instances\t");

scanf("%d",&r);

printf("Enter the Max Matrix\n");

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

{

for(j=0;j<r;j++)

{

scanf("%d",&max[i][j]);

}

}

printf("Enter the Allocation Matrix\n");

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

{

for(j=0;j<r;j++)

{

scanf("%d",&alloc[i][j]);

}

}

printf("Enter the available Resources\n");

for(j=0;j<r;j++)

{

scanf("%d",&avail[j]);

}

}

void show()

{

int i,j;

printf("Process\t Allocation\t Max\t Available\t");

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

{

printf("\nP%d\t ",i+1);

for(j=0;j<r;j++)

{

printf("%d ",alloc[i][j]);

}

printf("\t");

for(j=0;j<r;j++)

{

printf("%d ",max[i][j]);

}

printf("\t");

if(i==0)

{

for(j=0;j<r;j++)

printf("%d ",avail[j]);

}

}

}

void cal()

{

int finish[100],temp,need[100][100],flag=1,k,c1=0;

int safe[100];

int i,j;

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

{

finish[i]=0;

}

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

{

for(j=0;j<r;j++)

{

need[i][j]=max[i][j]-alloc[i][j];

}

}

printf("\n");

while(flag)

{

flag=0;

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

{

int c=0;

for(j=0;j<r;j++)

{

if((finish[i]==0)&&(need[i][j]<=avail[j]))

{

c++;

if(c==r)

{

for(k=0;k<r;k++)

{

avail[k]+=alloc[i][j];

finish[i]=1;

flag=1;

}

printf("P%d->",i);

if(finish[i]==1)

{

i=n;

}

}

}

}

}

}

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

{

if(finish[i]==1)

{

c1++;

}

else

{

printf("P%d->",i);

}

}

if(c1==n)

{

printf("\n The system is in safe state");

}

else

{

printf("\n Process are in dead lock");

printf("\n System is in unsafe state");

}

}

**15 Construct a C program to simulate producer-consumer problem using semaphores.**

#include<stdio.h>

#include<stdlib.h>

int mutex=1,full=0,empty=3,x=0;

int main()

{

int n;

void producer();

void consumer();

int wait(int);

int signal(int);

printf("\n1.Producer\n2.Consumer\n3.Exit");

while(1)

{

printf("\nEnter your choice:");

scanf("%d",&n);

switch(n)

{

case 1: if((mutex==1)&&(empty!=0))

producer();

else

printf("Buffer is full!!");

break;

case 2: if((mutex==1)&&(full!=0))

consumer();

else

printf("Buffer is empty!!");

break;

case 3:

exit(0);

break;

}

}

return 0;

}

int wait(int s)

{

return (--s);

}

int signal(int s)

{

return(++s);

}

void producer()

{

mutex=wait(mutex);

full=signal(full);

empty=wait(empty);

x++;

printf("\nProducer produces the item %d",x);

mutex=signal(mutex);

}

void consumer()

{

mutex=wait(mutex);

full=wait(full);

empty=signal(empty);

printf("\nConsumer consumes item %d",x);

x--;

mutex=signal(mutex);

}

**16. Construct a C program to simulate the First in First Out paging technique of memory management.**

#include <stdio.h>

int main()

{

int incomingStream[] = {4, 1, 2, 4, 5};

int pageFaults = 0;

int frames = 3;

int m, n, s, pages;

pages = sizeof(incomingStream)/sizeof(incomingStream[0]);

printf("Incoming \t Frame 1 \t Frame 2 \t Frame 3");

int temp[frames];

for(m = 0; m < frames; m++)

{

temp[m] = -1;

}

for(m = 0; m < pages; m++)

{

s = 0;

for(n = 0; n < frames; n++)

{

if(incomingStream[m] == temp[n])

{

s++;

pageFaults--;

}

}

pageFaults++;

if((pageFaults <= frames) && (s == 0))

{

temp[m] = incomingStream[m];

}

else if(s == 0)

{

temp[(pageFaults - 1) % frames] = incomingStream[m];

}

printf("\n");

printf("%d\t\t\t",incomingStream[m]);

for(n = 0; n < frames; n++)

{

if(temp[n] != -1)

printf(" %d\t\t\t", temp[n]);

else

printf(" - \t\t\t");

}

}

printf("\nTotal Page Faults:\t%d\n", pageFaults);

return 0;

}

**17. Construct a C program to simulate the Least Recently Used paging technique of memory management.**

#include<stdio.h>

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

int i, minimum = time[0], pos = 0;

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

if(time[i] < minimum){

minimum = time[i];

pos = i;

}

}

return pos;

}

int main()

{

int no\_of\_frames, no\_of\_pages, frames[10], pages[30], counter = 0, time[10], flag1, flag2, i, j, pos, faults = 0;

printf("Enter number of frames: ");

scanf("%d", &no\_of\_frames);

printf("Enter number of pages: ");

scanf("%d", &no\_of\_pages);

printf("Enter reference string: ");

for(i = 0; i < no\_of\_pages; ++i){

scanf("%d", &pages[i]);

}

for(i = 0; i < no\_of\_frames; ++i){

frames[i] = -1;

}

for(i = 0; i < no\_of\_pages; ++i){

flag1 = flag2 = 0;

for(j = 0; j < no\_of\_frames; ++j){

if(frames[j] == pages[i]){

counter++;

time[j] = counter;

flag1 = flag2 = 1;

break;

}

}

if(flag1 == 0){

for(j = 0; j < no\_of\_frames; ++j){

if(frames[j] == -1){

counter++;

faults++;

frames[j] = pages[i];

time[j] = counter;

flag2 = 1;

break;

}

}

}

if(flag2 == 0){

pos = findLRU(time, no\_of\_frames);

counter++;

faults++;

frames[pos] = pages[i];

time[pos] = counter;

}

printf("\n");

for(j = 0; j < no\_of\_frames; ++j){

printf("%d\t", frames[j]);

}

}

printf("\n\nTotal Page Faults = %d", faults);

return 0;

}

**18. Construct a C program to simulate the optimal paging technique of memory management**

#include<stdio.h>

int main()

{

int no\_of\_frames, no\_of\_pages, frames[10], pages[30], temp[10], flag1, flag2, flag3, i, j, k, pos, max, faults = 0;

printf("Enter number of frames: ");

scanf("%d", &no\_of\_frames);

printf("Enter number of pages: ");

scanf("%d", &no\_of\_pages);

printf("Enter page reference string: ");

for(i = 0; i < no\_of\_pages; ++i){

scanf("%d", &pages[i]);

}

for(i = 0; i < no\_of\_frames; ++i){

frames[i] = -1;

}

for(i = 0; i < no\_of\_pages; ++i){

flag1 = flag2 = 0;

for(j = 0; j < no\_of\_frames; ++j){

if(frames[j] == pages[i]){

flag1 = flag2 = 1;

break;

}

}

if(flag1 == 0){

for(j = 0; j < no\_of\_frames; ++j){

if(frames[j] == -1){

faults++;

frames[j] = pages[i];

flag2 = 1;

break;

}

}

}

if(flag2 == 0){

flag3 =0;

for(j = 0; j < no\_of\_frames; ++j){

temp[j] = -1;

for(k = i + 1; k < no\_of\_pages; ++k){

if(frames[j] == pages[k]){

temp[j] = k;

break;

}

}

}

for(j = 0; j < no\_of\_frames; ++j){

if(temp[j] == -1){

pos = j;

flag3 = 1;

break;

}

}

if(flag3 ==0){

max = temp[0];

pos = 0;

for(j = 1; j < no\_of\_frames; ++j){

if(temp[j] > max){

max = temp[j];

pos = j;

}

}

}

frames[pos] = pages[i];

faults++;

}

printf("\n");

for(j = 0; j < no\_of\_frames; ++j){

printf("%d\t", frames[j]);

}

}

printf("\n\nTotal Page Faults = %d", faults);

return 0;

}

**19. Consider a file system where the records of the file are stored one after another both physically and logically. A record of the file can only be accessed by reading all the previous records.  Design a C program to simulate the file allocation strategy.**

#include<stdio.h>

#include<conio.h>

#include<stdlib.h>

int main()

{

int f[50], i, st, len, j, c, k, count = 0;

for(i=0;i<50;i++)

f[i]=0;

printf("Files Allocated are : \n");

x : count=0;

printf("Enter starting block and length of files: ");

scanf("%d%d", &st,&len);

for(k=st;k<(st+len);k++)

if(f[k]==0)

count++;

if(len==count)

{

for(j=st;j<(st+len);j++)

if(f[j]==0)

{

f[j]=1;

printf("%d\t%d\n",j,f[j]);

}

if(j!=(st+len-1))

printf("The file is allocated to disk\n");

}

else

printf("The file is not allocated \n");

printf("Do you want to enter more file(Yes - 1/No - 0)");

scanf("%d", &c);

if(c==1)

goto x;

else

exit(0);

getch();

}

**20. Consider a file system that brings all the file pointers together into an index block. The ith entry in the index block points to the ith block of the file. Design a C program to simulate the file allocation strategy.**

#include<stdio.h>

#include<conio.h>

#include<stdlib.h>

int main()

{

int f[50], index[50],i, n, st, len, j, c, k, ind,count=0;

for(i=0;i<50;i++)

f[i]=0;

x:printf("Enter the index block: ");

scanf("%d",&ind);

if(f[ind]!=1)

{

printf("Enter no of blocks needed and no of files for the index %d on the disk : \n", ind);

scanf("%d",&n);

}

else

{

printf("%d index is already allocated \n",ind);

goto x;

}

y: count=0;

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

{

scanf("%d", &index[i]);

if(f[index[i]]==0)

count++;

}

if(count==n)

{

for(j=0;j<n;j++)

f[index[j]]=1;

printf("Allocated\n");

printf("File Indexed\n");

for(k=0;k<n;k++)

printf("%d-------->%d : %d\n",ind,index[k],f[index[k]]);

}

else

{

printf("File in the index is already allocated \n");

printf("Enter another file indexed");

goto y;

}

printf("Do you want to enter more file(Yes - 1/No - 0)");

scanf("%d", &c);

if(c==1)

goto x;

else

exit(0);

getch();

}

**21. With linked allocation, each file is a linked list of disk blocks; the disk blocks may be scattered anywhere on the disk. The directory contains a pointer to the first and last blocks of the file.  Each block contains a pointer to the next block. Design a C program to simulate the file allocation strategy.**

**#include<stdio.h>**

#include<conio.h>

#include<stdlib.h>

void main()

{

int f[50], p,i, st, len, j, c, k, a;

clrscr();

for(i=0;i<50;i++)

f[i]=0;

printf("Enter how many blocks already allocated: ");

scanf("%d",&p);

printf("Enter blocks already allocated: ");

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

{

scanf("%d",&a);

f[a]=1;

}

x: printf("Enter index starting block and length: ");

scanf("%d%d", &st,&len);

k=len;

if(f[st]==0)

{

for(j=st;j<(st+k);j++)

{

if(f[j]==0)

{

f[j]=1;

printf("%d-------->%d\n",j,f[j]);

}

else

{

printf("%d Block is already allocated \n",j);

k++;

}

}

}

else

printf("%d starting block is already allocated \n",st);

printf("Do you want to enter more file(Yes - 1/No - 0)");

scanf("%d", &c);

if(c==1)

goto x;

else

exit(0);

getch();

}

**22. Construct a C program to simulate the First Come First Served disk scheduling algorithm.**

#include<stdio.h>

#include<stdlib.h>

int main()

{

int ReadyQueue[100],i,n,TotalHeadMov=0,initial;

scanf("%d",&n);

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

scanf("%d",&ReadyQueue[i]);

}

scanf("%d",&initial);

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

{

TotalHeadMov=TotalHeadMov+abs(ReadyQueue[i]-initial);

initial=ReadyQueue[i];

}

printf("Total Head Movement=%d",TotalHeadMov);

}

**23. Design a C program to simulate SCAN disk scheduling algorithm.**

#include<stdio.h>

#include<stdlib.h>

// Function to perform SCAN disk scheduling

void SCAN(int arr[], int head, int size, int direction) {

int total\_movement = 0;

int current\_position = head;

int visited[size];

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

visited[i] = 0;

}

printf("Sequence of disk movements:\n");

while (1) {

int next\_position = -1;

// Scan towards right

if (direction == 1) {

for (int i = current\_position; i < size; i++) {

if (!visited[i] && (next\_position == -1 || abs(arr[i] - current\_position) < abs(arr[next\_position] - current\_position))) {

next\_position = i;

}

}

if (next\_position == -1) {

direction = 0; // Change direction to left

continue;

}

}

// Scan towards left

else {

for (int i = current\_position; i >= 0; i--) {

if (!visited[i] && (next\_position == -1 || abs(arr[i] - current\_position) < abs(arr[next\_position] - current\_position))) {

next\_position = i;

}

}

if (next\_position == -1) {

direction = 1; // Change direction to right

continue;

}

}

// Print the movement

printf("Move from %d to %d\n", current\_position, arr[next\_position]);

// Update total movement and mark the position as visited

total\_movement += abs(arr[next\_position] - current\_position);

visited[next\_position] = 1;

// Update current position

current\_position = arr[next\_position];

}

printf("Total disk movement: %d\n", total\_movement);

}

int main() {

int size, head;

printf("Enter the size of the disk queue: ");

scanf("%d", &size);

int arr[size];

printf("Enter the disk queue:\n");

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

scanf("%d", &arr[i]);

}

printf("Enter the initial head position: ");

scanf("%d", &head);

int direction;

printf("Enter the direction (1 for right, 0 for left): ");

scanf("%d", &direction);

SCAN(arr, head, size, direction);

return 0;

}

**24.. Develop a C program to simulate C-SCAN disk scheduling algorithm.**

#include <stdio.h>

#include <stdlib.h>

// Function to perform C-SCAN disk scheduling

void CSCAN(int arr[], int head, int size, int max) {

int total\_movement = 0;

int current\_position = head;

int visited[size];

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

visited[i] = 0;

}

printf("Sequence of disk movements:\n");

while (1) {

int next\_position = -1;

// Scan towards right

for (int i = current\_position; i < size; i++) {

if (!visited[i] && (next\_position == -1 || abs(arr[i] - current\_position) < abs(arr[next\_position] - current\_position))) {

next\_position = i;

}

}

// If no request found towards right, jump to the beginning

if (next\_position == -1) {

printf("Move from %d to %d\n", current\_position, max);

total\_movement += abs(max - current\_position);

current\_position = 0;

continue;

}

// Print the movement

printf("Move from %d to %d\n", current\_position, arr[next\_position]);

// Update total movement and mark the position as visited

total\_movement += abs(arr[next\_position] - current\_position);

visited[next\_position] = 1;

// Update current position

current\_position = arr[next\_position];

}

printf("Total disk movement: %d\n", total\_movement);

}

int main() {

int size, head, max;

printf("Enter the size of the disk queue: ");

scanf("%d", &size);

int arr[size];

printf("Enter the disk queue:\n");

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

scanf("%d", &arr[i]);

}

printf("Enter the initial head position: ");

scanf("%d", &head);

printf("Enter the maximum track of the disk: ");

scanf("%d", &max);

CSCAN(arr, head, size, max);

return 0;

}

**25. Illustrate the various File Access Permission and different types users in Linux**.

#include <stdio.h>

#include <stdlib.h>

#include <sys/stat.h>

int main(int argc, char \*argv[]) {

if (argc != 3) {

fprintf(stderr, "Usage: %s <filename> <permission\_mode>\n", argv[0]);

return EXIT\_FAILURE;

}

const char \*filename = argv[1];

const char \*permission\_mode\_str = argv[2];

// Convert permission mode string to an integer

int permission\_mode = strtol(permission\_mode\_str, NULL, 8);

// Change file permissions using chmod

if (chmod(filename, permission\_mode) == 0) {

printf("File permissions for %s changed successfully.\n", filename);

} else {

perror("Error changing file permissions");

return EXIT\_FAILURE;

}

return EXIT\_SUCCESS;

}

**25. Construct a C program to implement the I/O system calls of UNIX (fcntl, seek, stat, opendir, readdir)**

#include <stdio.h>

#include <stdlib.h>

#include <fcntl.h>

#include <unistd.h>

#include <sys/types.h>

#include <sys/stat.h>

#include <dirent.h>

void demonstrate\_fcntl(const char \*filename) {

int fd = open(filename, O\_RDONLY);

if (fd == -1) {

perror("Error opening file");

exit(EXIT\_FAILURE);

}

// Using fcntl to obtain file flags

int flags = fcntl(fd, F\_GETFL);

printf("File flags for %s: %d\n", filename, flags);

close(fd);

}

void demonstrate\_seek(const char \*filename) {

int fd = open(filename, O\_RDONLY);

if (fd == -1) {

perror("Error opening file");

exit(EXIT\_FAILURE);

}

// Using lseek to move the file cursor

off\_t offset = lseek(fd, 5, SEEK\_SET);

printf("File cursor position after seeking: %ld\n", (long)offset);

close(fd);

}

void demonstrate\_stat(const char \*filename) {

struct stat fileStat;

if (stat(filename, &fileStat) == -1) {

perror("Error getting file information");

exit(EXIT\_FAILURE);

}

printf("File Information for %s:\n", filename);

printf("Size: %ld bytes\n", fileStat.st\_size);

printf("Mode: %o\n", fileStat.st\_mode);

printf("Owner UID: %d\n", fileStat.st\_uid);

printf("Group GID: %d\n", fileStat.st\_gid);

}

void demonstrate\_opendir\_readdir(const char \*dirname) {

DIR \*dir = opendir(dirname);

if (dir == NULL) {

perror("Error opening directory");

exit(EXIT\_FAILURE);

}

printf("Contents of directory %s:\n", dirname);

struct dirent \*entry;

while ((entry = readdir(dir)) != NULL) {

printf("%s\n", entry->d\_name);

}

closedir(dir);

}

int main() {

const char \*filename = "example.txt";

const char \*dirname = ".";

// Demonstrate fcntl

printf("Demonstrating fcntl:\n");

demonstrate\_fcntl(filename);

printf("\n");

// Demonstrate seek

printf("Demonstrating seek:\n");

demonstrate\_seek(filename);

printf("\n");

// Demonstrate stat

printf("Demonstrating stat:\n");

demonstrate\_stat(filename);

printf("\n");

// Demonstrate opendir and readdir

printf("Demonstrating opendir and readdir:\n");

demonstrate\_opendir\_readdir(dirname);

return EXIT\_SUCCESS;

}

**26.Construct a C program to implement the file management operations.**

#include <stdio.h>

#include <stdlib.h>

void createFile(const char \*filename) {

FILE \*file = fopen(filename, "w");

if (file == NULL) {

perror("Error creating file");

exit(EXIT\_FAILURE);

}

printf("File '%s' created successfully.\n", filename);

fclose(file);

}

void writeFile(const char \*filename, const char \*content) {

FILE \*file = fopen(filename, "w");

if (file == NULL) {

perror("Error opening file for writing");

exit(EXIT\_FAILURE);

}

fprintf(file, "%s", content);

printf("Content written to '%s'.\n", filename);

fclose(file);

}

void readFile(const char \*filename) {

FILE \*file = fopen(filename, "r");

if (file == NULL) {

perror("Error opening file for reading");

exit(EXIT\_FAILURE);

}

char ch;

printf("Content of '%s':\n", filename);

while ((ch = fgetc(file)) != EOF) {

putchar(ch);

}

fclose(file);

}

void deleteFile(const char \*filename) {

if (remove(filename) == 0) {

printf("File '%s' deleted successfully.\n", filename);

} else {

perror("Error deleting file");

exit(EXIT\_FAILURE);

}

}

int main() {

const char \*filename = "example.txt";

const char \*content = "Hello, File Management in C!\n";

// Create and write to a file

createFile(filename);

writeFile(filename, content);

// Read from the file

readFile(filename);

// Delete the file

deleteFile(filename);

return EXIT\_SUCCESS;

}

27.Develop a C program for simulating the function of ls UNIX Command.

28.Write a C program for simulation of GREP UNIX command

29.Write a C program to simulate the solution of Classical Process Synchronization

Problem

#include <stdio.h>

#include <stdlib.h>

#include <pthread.h>

#include <semaphore.h>

#define BUFFER\_SIZE 5

sem\_t empty, full, mutex;

int buffer[BUFFER\_SIZE];

int in = 0, out = 0;

void \*producer(void \*arg) {

int item;

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

item = rand() % 100; // Producing a random item

sem\_wait(&empty);

sem\_wait(&mutex);

// Critical Section: Adding item to the buffer

buffer[in] = item;

printf("Produced: %d\n", item);

in = (in + 1) % BUFFER\_SIZE;

sem\_post(&mutex);

sem\_post(&full);

}

pthread\_exit(NULL);

}

void \*consumer(void \*arg) {

int item;

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

sem\_wait(&full);

sem\_wait(&mutex);

// Critical Section: Removing item from the buffer

item = buffer[out];

printf("Consumed: %d\n", item);

out = (out + 1) % BUFFER\_SIZE;

sem\_post(&mutex);

sem\_post(&empty);

}

pthread\_exit(NULL);

}

int main() {

pthread\_t producerThread, consumerThread;

// Initialize semaphores

sem\_init(&empty, 0, BUFFER\_SIZE);

sem\_init(&full, 0, 0);

sem\_init(&mutex, 0, 1);

// Create producer and consumer threads

pthread\_create(&producerThread, NULL, producer, NULL);

pthread\_create(&consumerThread, NULL, consumer, NULL);

// Wait for threads to finish

pthread\_join(producerThread, NULL);

pthread\_join(consumerThread, NULL);

// Destroy semaphores

sem\_destroy(&empty);

sem\_destroy(&full);

sem\_destroy(&mutex);

return 0;

}

30.Write C programs to demonstrate the following thread related concepts.

(i) create (ii) join (iii) equal (iv) exit

1. #include <stdio.h>
2. #include <pthread.h>
3. void \*printMessage(void \*message) {
4. char \*msg = (char \*)message;
5. printf("Thread Message: %s\n", msg);
6. pthread\_exit(NULL);
7. }
8. int main() {
9. pthread\_t thread;
10. char message[] = "Hello from the thread!";
11. // Create a thread
12. if (pthread\_create(&thread, NULL, printMessage, (void \*)message) != 0) {
13. fprintf(stderr, "Error creating thread\n");
14. return 1;
15. }
16. // Wait for the thread to finish
17. pthread\_join(thread, NULL);
18. printf("Main thread exiting.\n");
19. return 0;
20. }

**2.**

#include <stdio.h>

#include <pthread.h>

void \*printMessage(void \*message) {

char \*msg = (char \*)message;

printf("Thread Message: %s\n", msg);

pthread\_exit(NULL);

}

int main() {

pthread\_t thread;

char message[] = "Hello from the thread!";

// Create a thread

if (pthread\_create(&thread, NULL, printMessage, (void \*)message) != 0) {

fprintf(stderr, "Error creating thread\n");

return 1;

}

// Wait for the thread to finish

pthread\_join(thread, NULL);

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

return 0;

}

**3.**

#include <stdio.h>

#include <pthread.h>

void \*printMessage(void \*message) {

char \*msg = (char \*)message;

printf("Thread Message: %s\n", msg);

pthread\_exit(NULL);

}

int main() {

pthread\_t thread1, thread2;

char message[] = "Hello from the thread!";

// Create two threads

pthread\_create(&thread1, NULL, printMessage, (void \*)message);

pthread\_create(&thread2, NULL, printMessage, (void \*)message);

// Check if the threads are equal

if (pthread\_equal(thread1, thread2)) {

printf("The threads are equal.\n");

} else {

printf("The threads are not equal.\n");

}

// Wait for the threads to finish

pthread\_join(thread1, NULL);

pthread\_join(thread2, NULL);

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

return 0;

}

**4.**

#include <stdio.h>

#include <pthread.h>

void \*printMessage(void \*message) {

char \*msg = (char \*)message;

printf("Thread Message: %s\n", msg);

pthread\_exit(NULL);

}

int main() {

pthread\_t thread;

char message[] = "Hello from the thread!";

// Create a thread

if (pthread\_create(&thread, NULL, printMessage, (void \*)message) != 0) {

fprintf(stderr, "Error creating thread\n");

return 1;

}

// Wait for the thread to finish

pthread\_join(thread, NULL);

// Exit the main thread

pthread\_exit(NULL);

// This line will not be reached

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

return 0;

}

**31.Construct a C program to simulate the First in First Out paging technique of**

**memory management**.

#include <stdio.h>

#define MAX\_FRAMES 3

#define MAX\_PAGES 10

void fifoPageReplacement(int pages[], int n) {

int frames[MAX\_FRAMES];

int frameIndex = 0;

int pageFaults = 0;

int pageTable[MAX\_PAGES] = {0}; // To keep track of which pages are currently in frames

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

int currentPage = pages[i];

int pageFound = 0;

// Check if the page is already in a frame

for (int j = 0; j < MAX\_FRAMES; j++) {

if (frames[j] == currentPage) {

pageFound = 1;

break;

}

}

if (!pageFound) {

// Page fault

pageFaults++;

// Replace the oldest page in the frame (FIFO)

int replacedPage = frames[frameIndex];

frames[frameIndex] = currentPage;

// Update the page table

pageTable[replacedPage] = 0;

pageTable[currentPage] = 1;

frameIndex = (frameIndex + 1) % MAX\_FRAMES;

}

// Print the current state of frames

printf("Page %d: ", currentPage);

for (int j = 0; j < MAX\_FRAMES; j++) {

if (frames[j] == -1) {

printf("[ ] ");

} else {

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

}

}

printf("\n");

}

printf("\nTotal Page Faults: %d\n", pageFaults);

}

int main() {

int pages[MAX\_PAGES] = {0, 1, 2, 3, 0, 4, 1, 0, 2, 3};

printf("FIFO Page Replacement Simulation:\n\n");

fifoPageReplacement(pages, MAX\_PAGES);

return 0;

}

**32.Construct a C program to simulate the Least Recently Used paging technique of memory management.**

#include <stdio.h>

#define MAX\_FRAMES 3

#define MAX\_PAGES 10

void lruPageReplacement(int pages[], int n) {

int frames[MAX\_FRAMES];

int pageTable[MAX\_PAGES] = {0}; // To keep track of which pages are currently in frames

int pageFaults = 0;

int timeCounter = 1;

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

int currentPage = pages[i];

int pageFound = 0;

// Check if the page is already in a frame

for (int j = 0; j < MAX\_FRAMES; j++) {

if (frames[j] == currentPage) {

pageFound = 1;

// Update page's access time

pageTable[currentPage] = timeCounter++;

break;

}

}

if (!pageFound) {

// Page fault

pageFaults++;

// Find the least recently used page in frames

int lruIndex = 0;

for (int j = 1; j < MAX\_FRAMES; j++) {

if (pageTable[frames[j]] < pageTable[frames[lruIndex]]) {

lruIndex = j;

}

}

// Replace the least recently used page with the current page

frames[lruIndex] = currentPage;

// Update the page table

pageTable[currentPage] = timeCounter++;

}

// Print the current state of frames

printf("Page %d: ", currentPage);

for (int j = 0; j < MAX\_FRAMES; j++) {

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

}

printf("\n");

}

printf("\nTotal Page Faults: %d\n", pageFaults);

}

int main() {

int pages[MAX\_PAGES] = {0, 1, 2, 3, 0, 4, 1, 0, 2, 3};

printf("LRU Page Replacement Simulation:\n\n");

lruPageReplacement(pages, MAX\_PAGES);

return 0;

}