

**CSA0477 - OPERATING SYSTEMS**

**LAB RECORD**

**REPORT SUBMITTED BY**

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**UNDER THE GUIDANCE OF**

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**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.**

**int main() {**

**FILE \*file = fopen("employee.dat", "r+b");**

**if (file == NULL) {**

**// If file doesn't exist, create it**

**file = fopen("employee.dat", "w+b");**

**if (file == NULL) {**

**printf("Unable to create file.\n");**

**return 1;**

**}**

**}**

**int choice, id;**

**while (1) {**

**printf("\nEmployee Management System\n");**

**printf("1. Add Employee\n");**

**printf("2. Display Employee\n");**

**printf("3. Update Employee\n");**

**printf("4. List All Employees\n");**

**printf("5. Delete Employee\n");**

**printf("6. Exit\n");**

**printf("Enter your choice: ");**

**scanf("%d", &choice);**

**switch (choice) {**

**case 1:**

**addEmployee(file);**

**break;**

**case 2:**

**printf("Enter Employee ID to display: ");**

**scanf("%d", &id);**

**displayEmployee(file, id);**

**break;**

**case 3:**

**printf("Enter Employee ID to update: ");**

**scanf("%d", &id);**

**updateEmployee(file, id);**

**break;**

**case 4:**

**listAllEmployees(file);**

**break;**

**case 5:**

**printf("Enter Employee ID to delete: ");**

**scanf("%d", &id);**

**deleteEmployee(file, id);**

**break;**

**case 6:**

**fclose(file);**

**return 0;**

**default:**

**printf("Invalid choice. Try again.\n");**

**}**

**}**

**}**

**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>**

**void sortRequests(int requests[], int n) {**

**for (int i = 0; i < n - 1; i++) {**

**for (int j = 0; j < n - i - 1; j++) {**

**if (requests[j] > requests[j + 1]) {**

**// Swap the elements**

**int temp = requests[j];**

**requests[j] = requests[j + 1];**

**requests[j + 1] = temp;**

**}**

**}**

**}**

**}**

**int calculateSeekTime(int requests[], int n, int start, int direction) {**

**int totalSeekTime = 0;**

**sortRequests(requests, n);**

**int startPos;**

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

**if (requests[i] >= start) {**

**startPos = i;**

**break;**

**}**

**}**

**if (direction == 1) {**

**for (int i = startPos; i < n; i++) {**

**totalSeekTime += abs(requests[i] - start);**

**start = requests[i];**

**}**

**for (int i = startPos - 1; i >= 0; i--) {**

**totalSeekTime += abs(requests[i] - start);**

**start = requests[i];**

**}**

**} else {**

**for (int i = start Pos - 1; i >= 0; i--) {**

**total Seek Time += abs(requests[i] - start);**

**start = requests[i];**

**}**

**for (int i = start Pos; i < n; i++) {**

**total Seek Time += abs(requests[i] - start);**

**start = requests[i];**

**}**

**}**

**return total Seek Time;**

**}**

**int main() {**

**int n, start, direction;**

**print f("Enter the number of requests: ");**

**scan f("%d", &n);**

**int requests[n];**

**print f ("Enter the disk request positions: ");**

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

**scan f ("%d", &requests[i]);**

**}**

**Print f("Enter the starting position of the disk head: ");**

**Scan f("%d", &start);**

**Print f("Enter the direction (1 for right, -1 for left): ");**

**Scan f("%d", &direction);**

**int total Seek Time = calculate Seek Time (requests, n, start, direction);**

**print f("Total seek time is: %d\n", total Seek Time);**

**return 0;**

**}**

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

**#include <stdio.h>**

**#include <stdlib.h>**

**void cscan(int arr[], int n, int head, int disk\_size) {**

**int seek\_count = 0;**

**int distance = 0;**

**int curr = 0;**

**int left = 0;**

**int right = 0;**

**int left\_arr[50], right\_arr[50];**

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

**if (arr[i] < head) {**

**left\_arr[left++] = arr[i];**

**} else {**

**right\_arr[right++] = arr[i];**

**}**

**}**

**qsort(left\_arr, left, sizeof(int), compare);**

**qsort(right\_arr, right, sizeof(int), compare);**

**for (int i = 0; i < right; i++) {**

**distance = abs(head - right\_arr[i]);**

**seek\_count += distance;**

**head = right\_arr[i];**

**}**

**seek\_count += abs(head - (disk\_size - 1));**

**head = 0; // Move to the beginning of the disk**

**for (int i = left - 1; i >= 0; i--) {**

**distance = abs(head - left\_arr[i]);**

**seek\_count += distance;**

**head = left\_arr[i];**

**}**

**printf("Total Seek Time: %d\n", seek\_count);**

**}**

**int compare(const void \*a, const void \*b) {**

**return (\*(int \*)a - \*(int \*)b);**

**}**

**int main() {**

**int n, head, disk\_size;**

**printf("Enter the number of requests: ");**

**scanf("%d", &n);**

**int arr[n];**

**printf("Enter the disk requests: ");**

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

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

**}**

**printf("Enter the initial position of the disk head: ");**

**scanf("%d", &head);**

**printf("Enter the size of the disk (total cylinders): ");**

**scanf("%d", &disk\_size);**

**// Call the cscan function to simulate the algorithm**

**cscan(arr, n, head, disk\_size);**

**return 0;**

**}**

**the First in First Out paging technique of memory**

**management.**

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

**#include <stdio.h>**

**#include <sys/types.h>**

**#include <sys/stat.h>**

**#include <unistd.h>**

**void print\_permissions(mode\_t mode) {**

**printf("Permissions: ");**

**printf((S\_ISDIR(mode)) ? "d" : "-"); // Directory check**

**printf((mode & S\_IRUSR) ? "r" : "-"); // Owner read**

**printf((mode & S\_IWUSR) ? "w" : "-"); // Owner write**

**printf((mode & S\_IXUSR) ? "x" : "-"); // Owner execute**

**printf((mode & S\_IRGRP) ? "r" : "-"); // Group read**

**printf((mode & S\_IWGRP) ? "w" : "-"); // Group write**

**printf((mode & S\_IXGRP) ? "x" : "-"); // Group execute**

**printf((mode & S\_IROTH) ? "r" : "-"); // Others read**

**printf((mode & S\_IWOTH) ? "w" : "-"); // Others write**

**printf((mode & S\_IXOTH) ? "x" : "-"); // Others execute**

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

**}**

**int main() {**

**char filename[] = "testfile.txt"; // Change to your file path**

**struct stat file\_stat;**

**if (stat(filename, &file\_stat) == -1) {**

**perror("stat");**

**return 1;**

**}**

**print\_permissions(file\_stat.st\_mode);**

**if (chmod(filename, S\_IRUSR | S\_IWUSR | S\_IXUSR | S\_IRGRP | S\_IXGRP | S\_IROTH | S\_IXOTH) == -1) {**

**perror("chmod");**

**return 1;**

**}**

**printf("Permissions after modification:\n");**

**if (stat(filename, &file\_stat) == -1) {**

**perror("stat");**

**return 1;**

**}**

**print\_permissions(file\_stat.st\_mode);**

**return 0;**

**}**

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

**#include <stdio.h>**

**#include <stdlib.h>**

**void createFile();**

**void writeFile();**

**void readFile();**

**void appendFile();**

**void deleteFile();**

**int main() {**

**int choice;**

**while (1) {**

**printf("\n--- File Management Operations ---\n");**

**printf("1. Create/Open File\n");**

**printf("2. Write to File\n");**

**printf("3. Read from File\n");**

**printf("4. Append to File\n");**

**printf("5. Delete File\n");**

**printf("6. Exit\n");**

**printf("Enter your choice: ");**

**scanf("%d", &choice);**

**switch (choice) {**

**case 1:**

**createFile();**

**break;**

**case 2:**

**writeFile();**

**break;**

**case 3:**

**readFile();**

**break;**

**case 4:**

**appendFile();**

**break;**

**case 5:**

**deleteFile();**

**break;**

**case 6:**

**printf("Exiting program.\n");**

**exit(0);**

**default:**

**printf("Invalid choice! Please try again.\n");**

**}**

**}**

**return 0;**

**}**

**void createFile() {**

**FILE \*file;**

**char filename[100];**

**printf("Enter**

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

**#include <stdio.h>**

**#include <stdlib.h>**

**#include <dirent.h>**

**#include <sys/types.h>**

**#include <sys/stat.h>**

**#include <unistd.h>**

**#include <time.h>**

**void list\_directory(const char \*path) {**

**struct dirent \*entry;**

**DIR \*dp = opendir(path);**

**if (dp == NULL) {**

**perror("opendir");**

**return;**

**}**

**// Print directory contents**

**while ((entry = readdir(dp)) != NULL) {**

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

**}**

**closedir(dp);**

**}**

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

**if (argc == 1) {**

**// If no directory is provided, use the current directory**

**list\_directory(".");**

**} else {**

**// List the directory pas**

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

**#include <stdio.h>**

**#include <string.h>**

**#include <stdlib.h>**

**int matchPattern(const char \*line, const char \*pattern) {**

**return strstr(line, pattern) != NULL;**

**}**

**void simulateGrep(const char \*filename, const char \*pattern) {**

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

**if (file == NULL) {**

**perror("Error opening file");**

**return;**

**}**

**char line[1024];**

**while (fgets(line, sizeof(line), file) != NULL) {**

**if (matchPattern(line, pattern)) {**

**printf("%s", line);**

**}**

**}**

**fclose(file);**

**}**

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

**// Check if correct arguments are**

**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 MAX 5 // Maximum size of the buffer**

**int buffer[MAX]; // Shared buffer**

**int in = 0, out = 0; // Buffers indices for producer and consumer**

**sem\_t empty, full, mutex;**

**void \*producer(void \*arg) {**

**int item;**

**while (1) {**

**item = rand() % 100; // Produce an item**

**sem\_wait(&empty); // Wait for empty space in buffer**

**sem\_wait(&mutex); // Ensure mutual exclusion**

**buffer[in] = item; // Insert item into buffer**

**printf("Produced: %d at index %d\n", item, in);**

**in = (in + 1) % MAX; // Move to next buffer index**

**sem\_post(&mutex); // Release mutual exclusion**

**sem\_post(&full); // Signal that there is a new item in the buffer**

**sleep(1); // Simulate time taken to produce**

**}**

**void \*consumer(void \*arg) {**

**int item;**

**while (1) {**

**sem\_wait(&full); // Wait for full space in buffer**

**sem\_wait(&mutex);**

**item = buffer[out];**

**printf("Consumed: %d from index %d\n", item, out);**

**out = (out + 1) % MAX;**

**sem\_post(&mutex);**

**sem\_post(&empty);**

**sleep(1);**

**}**

**}**

**int main() {**

**pthread\_t pr**

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

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

**#include <pthread.h>**

**#include <stdio.h>**

**void\* print\_message(void\* ptr) {**

**printf("Hello from the thread!\n");**

**return NULL;**

**}**

**int main() {**

**pthread\_t thread\_id;**

**if (pthread\_create(&thread\_id, NULL, print\_message, NULL)) {**

**printf("Error creating thread\n");**

**return 1;**

**}**

**pthread\_join(thread\_id, NULL);**

**printf("Main thread finished\n");**

**return 0;**

**}**

**31. Construct a C program to simulate**

**management.**

**#include <stdio.h>**

**#include <stdlib.h>**

**#include <string.h>**

**#define MAX\_EMPLOYEES 10**

**struct Employee {**

**int id;**

**char name[100];**

**float salary;**

**};**

**struct Employee employees[MAX\_EMPLOYEES];**

**int employeeCount = 0;**

**void addEmployee() {**

**if (employeeCount >= MAX\_EMPLOYEES) {**

**printf("Error: Cannot add more employees, storage full.\n");**

**return;**

**}**

**struct Employee newEmployee;**

**printf("Enter employee ID: ");**

**scanf("%d", &newEmployee.id);**

**getchar(); // To capture the newline character**

**printf("Enter employee name: ");**

**fgets(newEmployee.name, 100, stdin);**

**newEmployee.name[strcspn(newEmployee.name, "\n")] = '\0'; // Remove newline**

**printf("Enter employee salary: ");**

**scanf("%f", &newEmployee.salary);**

**employees[employeeCount] = newEmployee;**

**employeeCount++;**

**printf("Employee added successfully!\n");**

**}**

**void removeEmployee() {**

**int id, found = 0;**

**printf("Enter employee ID to remove: ");**

**scanf("%d", &id);**

**for (int i = 0; i < employeeCount; i++) {**

**if (employees[i].id == id) {**

**for (int j = i; j < employeeCount - 1; j++) {**

**employees[j] = employees[j + 1];**

**}**

**employeeCount--;**

**printf("Employee with ID %d removed successfully!\n", id);**

**found = 1;**

**break;**

**}**

**}**

**if (!found) {**

**printf("Error: Employee not found.\n");**

**}**

**}**

**void displayEmployees() {**

**if (employeeCount == 0) {**

**printf("No employees to display.\n");**

**return;**

**}**

**printf("\nEmployee List:\n");**

**printf("ID\tName\t\tSalary\n");**

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

**for (int i = 0; i < employeeCount; i++) {**

**printf("%d\t%s\t%.2f\n", employees[i].id, employees[i].name, employees[i].salary);**

**}**

**}**

**void searchEmployee() {**

**int id, found = 0;**

**printf("Enter employee ID to search: ");**

**scanf("%d", &id);**

**for (int i = 0; i < employeeCount; i++) {**

**if (employees[i].id == id) {**

**printf("\nEmployee found:\n");**

**printf("ID: %d\n", employees[i].id);**

**printf("Name: %s\n", employees[i].name);**

**printf("Salary: %.2f\n", employees[i].salary);**

**found = 1;**

**break;**

**}**

**}**

**if (!found) {**

**printf("Error: Employee not found.\n");**

**}**

**}**

**int main() {**

**int choice;**

**while (1) {**

**printf("\n===== Employee Management System =====\n");**

**printf("1. Add Employee\n");**

**printf("2. Remove Employee\n");**

**printf("3. Display Employees\n");**

**printf("4. Search Employee\n");**

**printf("5. Exit\n");**

**printf("Enter your choice: ");**

**scanf("%d", &choice);**

**switch (choice) {**

**case 1:**

**addEmployee();**

**break;**

**case 2:**

**removeEmployee();**

**break;**

**case 3:**

**displayEmployees();**

**break;**

**case 4:**

**searchEmployee();**

**break;**

**case 5:**

**printf("Exiting the system...\n");**

**exit(0);**

**default:**

**printf("Invalid choice, please try again.\n");**

**}**

**}**

**return 0;**

**}**

**32. Construct a C program to simulate**

**management.**

**#include <stdio.h>**

**#include <stdlib.h>**

**#include <string.h>**

**#define MAX\_EMPLOYEES 100**

**struct Employee {**

**int id;**

**char name[100];**

**float salary;**

**};**

**struct Employee employees[MAX\_EMPLOYEES];**

**int employeeCount = 0;**

**void addEmployee() {**

**if (employeeCount >= MAX\_EMPLOYEES) {**

**printf("Error: Cannot add more employees, storage full.\n");**

**return;**

**}**

**struct Employee newEmployee;**

**printf("Enter employee ID: ");**

**scanf("%d", &newEmployee.id);**

**getchar();**

**printf("Enter employee name: ");**

**fgets(newEmployee.name, 100, stdin);**

**newEmployee.name[strcspn(newEmployee.name, "\n")] = '\0'; // Remove newline**

**printf("Enter employee salary: ");**

**scanf("%f", &newEmployee.salary);**

**employees[employeeCount] = newEmployee;**

**employeeCount++;**

**printf("Employee added successfully!\n");**

**}**

**void removeEmployee() {**

**int id, found = 0;**

**printf("Enter employee ID to remove: ");**

**scanf("%d", &id);**

**for (int i = 0; i < employeeCount; i++) {**

**if (employees[i].id == id) {**

**for (int j = i; j < employeeCount - 1; j++) {**

**employees[j] = employees[j + 1];**

**}**

**employeeCount--;**

**printf("Employee with ID %d removed successfully!\n", id);**

**found = 1;**

**break;**

**}**

**}**

**if (!found) {**

**printf("Error: Employee not found.\n");**

**}**

**}**

**void displayEmployees() {**

**if (employeeCount == 0) {**

**printf("No employees to display.\n");**

**return;**

**}**

**printf("\nEmployee List:\n");**

**printf("ID\tName\t\tSalary\n");**

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

**for (int i = 0; i < employeeCount; i++) {**

**printf("%d\t%s\t%.2f\n", employees[i].id, employees[i].name, employees[i].salary);**

**}**

**}**

**void searchEmployee() {**

**int id, found = 0;**

**printf("Enter employee ID to search: ");**

**scanf("%d", &id);**

**for (int i = 0; i < employeeCount; i++) {**

**if (employees[i].id == id) {**

**printf("\nEmployee found:\n");**

**printf("ID: %d\n", employees[i].id);**

**printf("Name: %s\n", employees[i].name);**

**printf("Salary: %.2f\n", employees[i].salary);**

**found = 1;**

**break;**

**}**

**}**

**if (!found) {**

**printf("Error: Employee not found.\n");**

**}**

**}**

**int main() {**

**int choice;**

**while (1) {**

**printf("\n===== Employee Management System =====\n");**

**printf("1. Add Employee\n");**

**printf("2. Remove Employee\n");**

**printf("3. Display Employees\n");**

**printf("4. Search Employee\n");**

**printf("5. Exit\n");**

**printf("Enter your choice: ");**

**scanf("%d", &choice);**

**switch (choice) {**

**case 1:**

**addEmployee();**

**break;**

**case 2:**

**removeEmployee();**

**break;**

**case 3:**

**displayEmployees();**

**break;**

**case 4:**

**searchEmployee();**

**break;**

**case 5:**

**printf("Exiting the system...\n");**

**exit(0);**

**default:**

**printf("Invalid choice, please try again.\n");**

**}**

**}**

**return 0;**

**}**

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

**#include <stdio.h>**

**#define MAX\_FRAMES 3**

**void optimal\_page\_replacement(int pages[], int n, int frames) {**

**int memory[frames]; // Array representing frames in memory**

**int i, j, k, page\_faults = 0, page\_found;**

**for (i = 0; i < frames; i++) {**

**memory[i] = -1;**

**}**

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

**page\_found = 0;**

**for (j = 0; j < frames; j++) {**

**if (memory[j] == pages[i]) {**

**page\_found = 1;**

**break;**

**}**

**}**

**if (page\_found == 0) {**

**page\_faults++;**

**int farthest = -1, replace\_index = -1;**

**for (j = 0; j < frames; j+**

**34. Consider a file system 33. Construct a C program to simulate the optimal paging technique of memory management**

**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.**

**. Consider a file system that brings all the file pointers together into an index block. The i th**

**entry in the index block points to the i th block of the**

**36. Illustrate the concept 35of multithreading using a C program.**

**#include <stdio.h>**

**#include <pthread.h>**

**void\* print\_message(void\* msg) {**

**printf("%s\n", (char\*)msg);**

**return NULL;**

**}**

**int main() {**

**pthread\_t thread1, thread2;**

**char\* msg1 = "Hello from Thread 1";**

**char\* msg2 = "Hello from Thread 2";**

**pthread\_create(&thread1, NULL, print\_message, (void\*)msg1);**

**pthread\_create(&thread2, NULL, print\_message, (void\*)msg2);**

**pthread\_join(thread1, NULL);**

**pthread\_join(thread2, NULL);**

**printf("Main thread ends.\n");**

**return 0;**

**}**

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

**#include <stdio.h>**

**#include <pthread.h>**

**#include <unistd.h>**

**#define NUM\_PHILOSOPHERS 5**

**pthread\_mutex\_t forks[NUM\_PHILOSOPHERS];**

**void\* philosopher(void\* num) {**

**int id = \*(int\*)num;**

**while (1) {**

**printf("Philosopher %d is thinking.\n", id);**

**usleep(1000000);**

**pthread\_mutex\_lock(&forks[id]);**

**pthread\_mutex\_lock(&forks[(id + 1) % NUM\_PHILOSOPHERS]);**

**printf("Philosopher %d is eating.\n", id);**

**usleep(1000000);**

**pthread\_mutex\_unlock(&forks[id]);**

**pthread\_mutex\_unlock(&forks[(id + 1) % NUM\_PHILOSOPHERS]);**

**}**

**return NULL;**

**}**

**int main() {**

**pthread\_t philosophers[NUM\_PHILOSOPHERS];**

**int ids[NUM\_PHILOSOPHERS];**

**for (int i = 0; i < NUM\_PHILOSOPHERS; i++) {**

**pthread\_mutex\_init(&forks[i], NULL);**

**ids[i] = i;**

**}**

**for (int i = 0; i < NUM\_PHILOSOPHERS; i++) {**

**pthread\_create(&philosophers[i], NULL, philosopher, (void\*)&ids[i]);**

**}**

**for (int i = 0; i < NUM\_PHILOSOPHERS; i++) {**

**pthread\_join(philosophers[i], NULL);**

**}**

**for (int i = 0; i < NUM\_PHILOSOPHERS; i++) {**

**pthread\_mutex\_destroy(&forks[i]);**

**}**

**return 0;**

**}**

**38. Construct a C program for implementation the various memory allocation strategies.**

**#include <stdio.h>**

**#include <stdlib.h>**

**#define MAX\_BLOCKS 10**

**#define MAX\_PROCESSES 5**

**typedef struct {**

**int size;**

**int is\_free;**

**} Block;**

**Block memory[MAX\_BLOCKS];**

**void first\_fit(int process\_size) {**

**for (int i = 0; i < MAX\_BLOCKS; i++) {**

**if (memory[i].is\_free && memory[i].size >= process\_size) {**

**printf("Allocating process of size %d to block %d\n", process\_size, i);**

**memory[i].is\_free = 0;**

**return;**

**}**

**}**

**printf("No suitable block found for process of size %d\n", process\_size);**

**}**

**void best\_fit(int process\_size) {**

**int best\_idx = -1;**

**for (int i = 0; i < MAX\_BLOCKS; i++) {**

**if (memory[i].is\_free && memory[i].size >= process\_size) {**

**if (best\_idx == -1 || memory[i].size < memory[best\_idx].size) {**

**best\_idx = i;**

**}**

**}**

**}**

**if (best\_idx != -1) {**

**printf("Allocating process of size %d to block %d\n", process\_size, best\_idx);**

**memory[best\_idx].is\_free = 0;**

**} else {**

**printf("No suitable block found for process of size %d\n", process\_size);**

**}**

**}**

**void worst\_fit(int process\_size) {**

**int worst\_idx = -1;**

**for (int i = 0; i < MAX\_BLOCKS; i++) {**

**if (memory[i].is\_free && memory[i].size >= process\_size) {**

**if (worst\_idx == -1 || memory[i].size > memory[worst\_idx].size) {**

**worst\_idx = i;**

**}**

**}**

**}**

**if (worst\_idx != -1) {**

**printf("Allocating process of size %d to block %d\n", process\_size, worst\_idx);**

**memory[worst\_idx].is\_free = 0;**

**} else {**

**printf("No suitable block found for process of size %d\n", process\_size);**

**}**

**}**

**int main() {**

**// Initialize memory blocks**

**for (int i = 0; i < MAX\_BLOCKS; i++) {**

**memory[i].size = (i + 1) \* 50;**

**memory[i].is\_free = 1;**

**}**

**first\_fit(100);**

**best\_fit(60);**

**worst\_fit(150);**

**return 0;**

**}**

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

**#include <stdio.h>**

**#include <string.h>**

**#define MAX\_FILES 10**

**typedef struct {**

**char filename[100];**

**} File;**

**typedef struct {**

**File files[MAX\_FILES];**

**int count;**

**} Directory;**

**void create\_file(Directory\* dir, const char\* filename) {**

**if (dir->count < MAX\_FILES) {**

**strcpy(dir->files[dir->count].filename, filename);**

**dir->count++;**

**} else {**

**printf("Directory is full!\n");**

**}**

**}**

**void list\_files(Directory\* dir) {**

**if (dir->count == 0) {**

**printf("Directory is empty.\n");**

**} else {**

**printf("Files in directory:\n");**

**for (int i = 0; i < dir->count; i++) {**

**printf("%s\n", dir->files[i].filename);**

**}**

**}**

**}**

**int main() {**

**Directory dir = {.count = 0};**

**create\_file(&dir, "file1.txt");**

**create\_file(&dir, "file2.txt");**

**create\_file(&dir, "file3.txt");**

**list\_files(&dir);**

**return 0;**

**}**

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

**#include <stdio.h>**

**#include <string.h>**

**#define MAX\_FILES 5**

**#define MAX\_SUBDIRS 3**

**typedef struct {**

**char filename[100];**

**} File;**

**typedef struct {**

**char dirname[100];**

**File files[MAX\_FILES];**

**int file\_count;**

**} Subdirectory;**

**typedef struct {**

**Subdirectory subdirs[MAX\_SUBDIRS];**

**int subdir\_count;**

**} Directory;**

**void create\_file(Directory\* dir, int subdir\_index, const char\* filename) {**

**if (subdir\_index >= dir->subdir\_count || dir->subdirs[subdir\_index].file\_count >= MAX\_FILES) {**

**printf("Error: Cannot create file.\n");**

**return;**

**}**

**strcpy(dir->subdirs[subdir\_index].files[dir->subdirs[subdir\_index].file\_count].filename, filename);**

**dir->subdirs[subdir\_index].file\_count++;**

**}**

**void create\_subdir(Directory\* dir, const char\* subdir\_name) {**

**if (dir->subdir\_count < MAX\_SUBDIRS) {**

**strcpy(dir->subdirs[dir->subdir\_count].dirname, subdir\_name);**

**dir->subdirs[dir->subdir\_count].file\_count = 0;**

**dir->subdir\_count++;**

**} else {**

**printf("Error: Cannot create subdirectory.\n");**

**}**

**}**

**void list\_files(Directory\* dir) {**

**for (int i = 0; i < dir->subdir\_count; i++) {**

**printf("Subdirectory: %s\n", dir->subdirs[i].dirname);**

**for (int j = 0; j < dir->subdirs[i].file\_count; j++) {**

**printf("\t%s\n", dir->subdirs[i].files[j].filename);**

**}**

**}**

**}**

**int main() {**

**Directory dir = {.subdir\_count = 0};**

**create\_subdir(&dir, "Documents");**

**create\_subdir(&dir, "Images");**

**create\_file(&dir, 0, "file1.txt");**

**create\_file(&dir, 1, "image1.jpg");**

**list\_files(&dir);**

**return 0;**

**}**