Registration Number: 19BCE2119

Name: Gaurav Kumar Singh

Course: Operating System

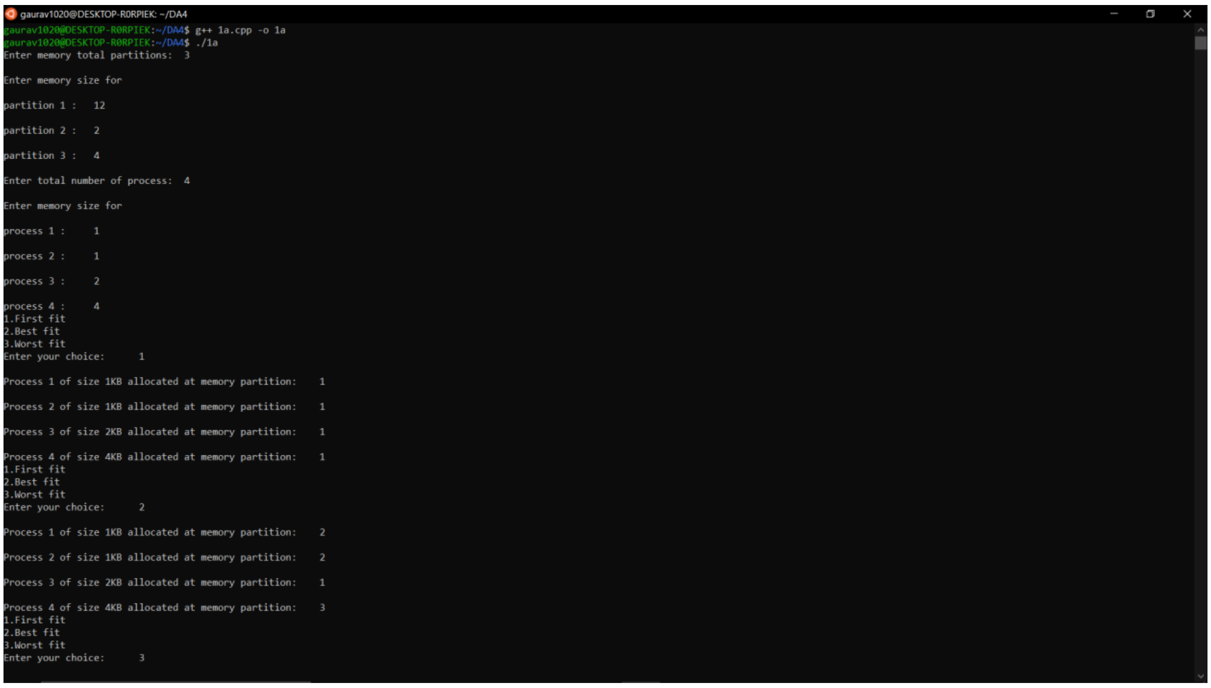
Digital Assignment-4

1. Memory Management

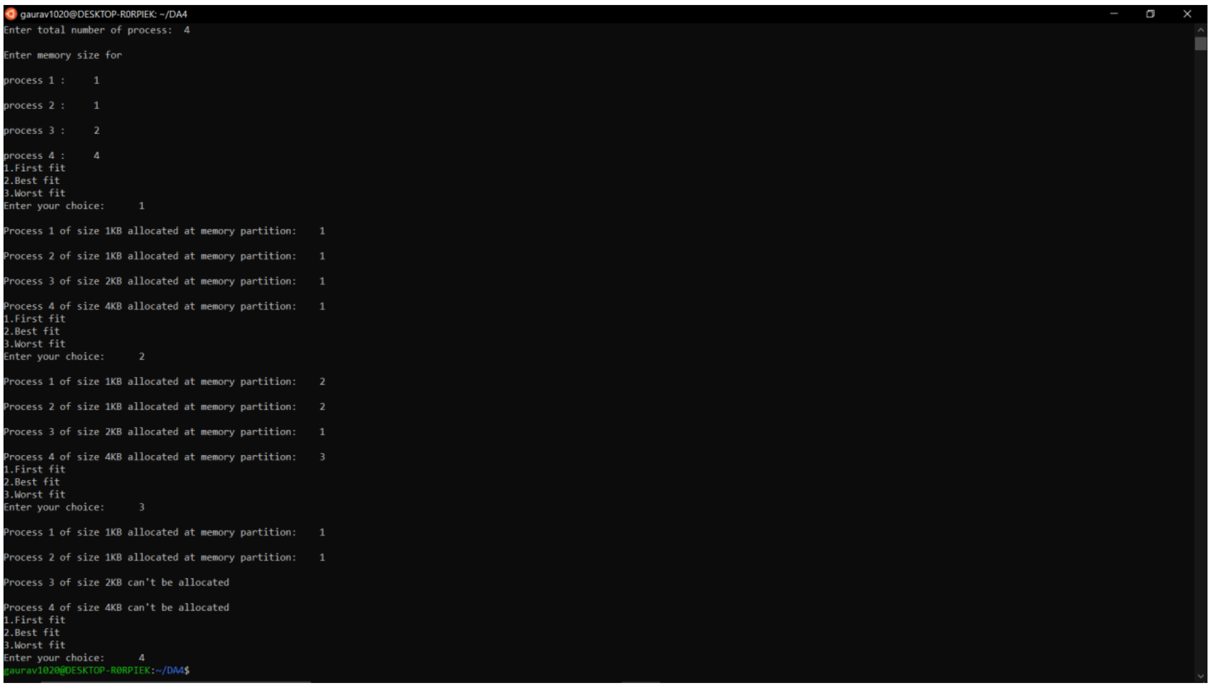
(a)

```
#include <iostream>

using namespace std;
int main() {
  int c, i, j, k, n, l, m[10], p[10], po[20], flag, z, y, temp, temp1;
  cout << "Enter memory total partitions:\t";
  cin >> n;
  cout << "\nEnter memory size for\n";
  for (i = 1; i <= n; i++) {
    cout << "\npartition " << i << " :\t";
    cin >> m[i];
    po[i] = i;
  }
  cout << "\nEnter total number of process:\t";
  cin >> j;
  cout << "\nEnter memory size for\n";
  for (i = 1; i <= j; i++) {
    cout << "\nprocess " << i << " :\t";
    cin >> p[i];
  }
  c = 1;
  while (c > 0 && c < 4) {
    cout << "1.First fit\n2.Best fit\n3.Worst fit\nEnter your choice:\t";
    cin >> c;
    switch (c) {
    case 1:
      for (i = 1; i <= j; i++) {
        flag = 1;
        for (k = 1; k <= n; k++) {
          if (p[i] <= m[k]) {
            cout << "\nProcess " << i << " of size " << p[i] << "KB allocated at memory partition:\t" <<
po[k];
            m[k] = m[k] - p[i];
            break;
          } else {
            flag++;
          }
        }
        if (flag > n) {
          cout << "\nProcess " << i << " of size " << p[i] << "KB can't be allocated";
        }
        cout << "\n";

      }
      break;
    case 2:
      for (y = 1; y <= n; y++) {
        for (z = y; z <= n; z++) {
          if (m[y] > m[z]) {
            temp = m[y];
            m[y] = m[z];
            m[z] = temp;
            temp1 = po[y];
            po[y] = po[z];
            po[z] = temp1;
          }
        }
      }
      for (i = 1; i <= j; i++) {
        flag = 1;
        for (k = 1; k <= n; k++) {

          if (p[i] <= m[k]) {
            cout << "\nProcess " << i << " of size " << p[i] << "KB allocated at memory partition:\t" <<
po[k];
            m[k] = m[k] - p[i];
            break;
          } else {
            flag++;
          }
        }
        if (flag > n) {
          cout << "\nProcess " << i << " of size " << p[i] << "KB can't be allocated";
        }
        cout << "\n";
      }
      break;
    case 3:
      for (y = 1; y <= n; y++) {
        for (z = y; z <= n; z++) {
          if (m[y] < m[z]) {
            temp = m[y];
            m[y] = m[z];
            m[z] = temp;
            temp1 = po[y];
            po[y] = po[z];
            po[z] = temp1;
          }
        }
      }
      for (i = 1; i <= j; i++) {
        flag = 1;
        for (k = 1; k <= n; k++) {
          if (p[i] <= m[k]) {
            cout << "\nProcess " << i << " of size " << p[i] << "KB allocated at memory partition:\t" <<
po[k];
            m[k] = m[k] - p[i];
            break;
          } else {
            flag++;
          }
        }
        if (flag > n) {
          cout << "\nProcess " << i << " of size " << p[i] << "KB can't be allocated";
        }
        cout << "\n";
      }
      break;
    }
  }
  return 0;
}
```

OUTPUT



```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ g++ 1a.cpp -o 1a
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./1a
Enter memory total partitions:  3

Enter memory size for

partition 1 :   12

partition 2 :   2

partition 3 :   4

Enter total number of process:  4

Enter memory size for

process 1 :     1

process 2 :     1

process 3 :     2

process 4 :     4
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      1

Process 1 of size 1KB allocated at memory partition:    1

Process 2 of size 1KB allocated at memory partition:    1

Process 3 of size 2KB allocated at memory partition:    1

Process 4 of size 4KB allocated at memory partition:    1
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      2

Process 1 of size 1KB allocated at memory partition:    2

Process 2 of size 1KB allocated at memory partition:    2

Process 3 of size 2KB allocated at memory partition:    1

Process 4 of size 4KB allocated at memory partition:    3
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      3
```



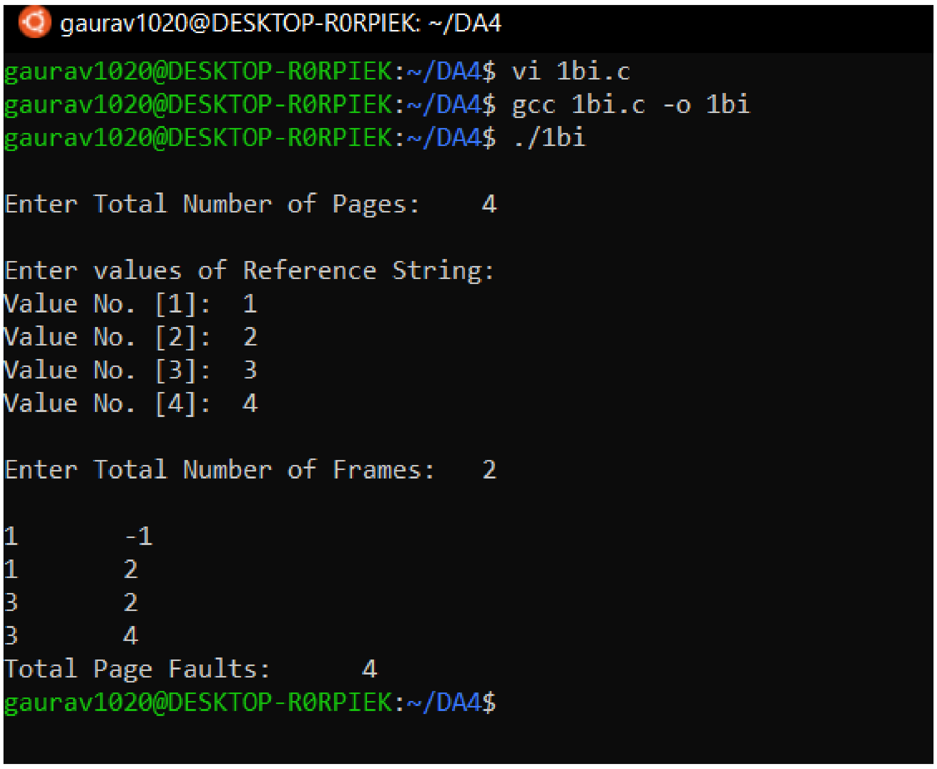
```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
Enter total number of process:  4

Enter memory size for

process 1 :     1

process 2 :     1

process 3 :     2

process 4 :     4
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      1

Process 1 of size 1KB allocated at memory partition:    1

Process 2 of size 1KB allocated at memory partition:    1

Process 3 of size 2KB allocated at memory partition:    1

Process 4 of size 4KB allocated at memory partition:    1
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      2

Process 1 of size 1KB allocated at memory partition:    2

Process 2 of size 1KB allocated at memory partition:    2

Process 3 of size 2KB allocated at memory partition:    1

Process 4 of size 4KB allocated at memory partition:    3
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      3

Process 1 of size 1KB allocated at memory partition:    1

Process 2 of size 1KB allocated at memory partition:    1

Process 3 of size 2KB can't be allocated

Process 4 of size 4KB can't be allocated
1.First fit
2.Best fit
3.Worst fit
Enter your choice:      4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

(b)

i) FIFO

```
#include<stdio.h>
int main() {
  int reference_string[10], page_faults = 0, m, n, s, pages, frames;
  printf("\nEnter Total Number of Pages:\t");
  scanf("%d", & pages);
  printf("\nEnter values of Reference String:\n");
  for (m = 0; m < pages; m++)  {
    printf("Value No. [%d]:\t", m + 1);
    scanf("%d", & reference_string[m]);
  }
  printf("\nEnter Total Number of Frames:\t");
  scanf("%d", & frames);
  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 (reference_string[m] == temp[n]){
        s++;
        page_faults--;
      }
    }
    page_faults++;
    if ((page_faults <= frames) && (s == 0)){
      temp[m] = reference_string[m];
    } else if (s == 0){
      temp[(page_faults - 1) % frames] = reference_string[m];
    }
    printf("\n");
    for (n = 0; n < frames; n++){
      printf("%d\t", temp[n]);
    }
  }
  printf("\nTotal Page Faults:\t%d\n", page_faults);
  return 0;
}
```

OUTPUT

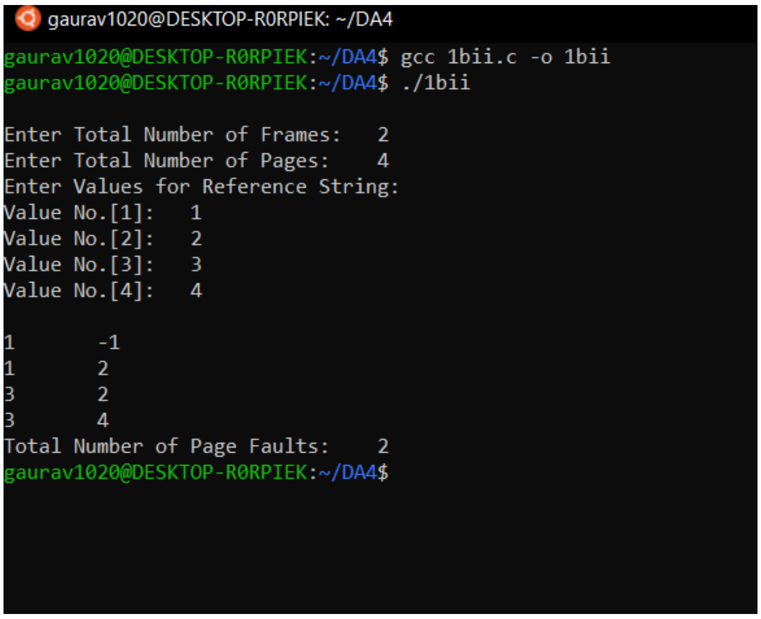


```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 1bi.c
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 1bi.c -o 1bi
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./1bi

Enter Total Number of Pages:    4

Enter values of Reference String:
Value No. [1]:  1
Value No. [2]:  2
Value No. [3]:  3
Value No. [4]:  4

Enter Total Number of Frames:   2

1       -1
1       2
3       2
3       4
Total Page Faults:      4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

ii) LRU

```
#include<stdio.h>
int main(){
  int frames[10], temp[10], pages[10];
  int total_pages, m, n, position, k, l, total_frames;
  int a = 0, b = 0, page_fault = 0;
  printf("\nEnter Total Number of Frames:\t");
  scanf("%d", & total_frames);
  for (m = 0; m < total_frames; m++){
    frames[m] = -1;
  }
  printf("Enter Total Number of Pages:\t");
  scanf("%d", & total_pages);
  printf("Enter Values for Reference String:\n");
  for (m = 0; m < total_pages; m++){
    printf("Value No.[%d]:\t", m + 1);
    scanf("%d", & pages[m]);
  }
  for (n = 0; n < total_pages; n++){
    a = 0, b = 0;
    for (m = 0; m < total_frames; m++){
      if (frames[m] == pages[n]){
        a = 1;
        b = 1;
        break;
      }
    }
    if (a == 0){
      for (m = 0; m < total_frames; m++){
        if (frames[m] == -1){
          frames[m] = pages[n];
          b = 1;
          break;
        }
      }
    }
    if (b == 0){
      for (m = 0; m < total_frames; m++){
        temp[m] = 0;
      }
      for (k = n - 1, l = 1; l <= total_frames - 1; l++, k--){
        for (m = 0; m < total_frames; m++){
          if (frames[m] == pages[k]){
            temp[m] = 1;
          }
        }
      }
      for (m = 0; m < total_frames; m++){
        if (temp[m] == 0){
          position = m;
        }
      }
      frames[position] = pages[n];
      page_fault++;
    }
    printf("\n");
    for (m = 0; m < total_frames; m++){
      printf("%d\t", frames[m]);
    }
  }
  printf("\nTotal Number of Page Faults:\t%d\n", page_fault);
  return 0;
}
```

OUTPUT

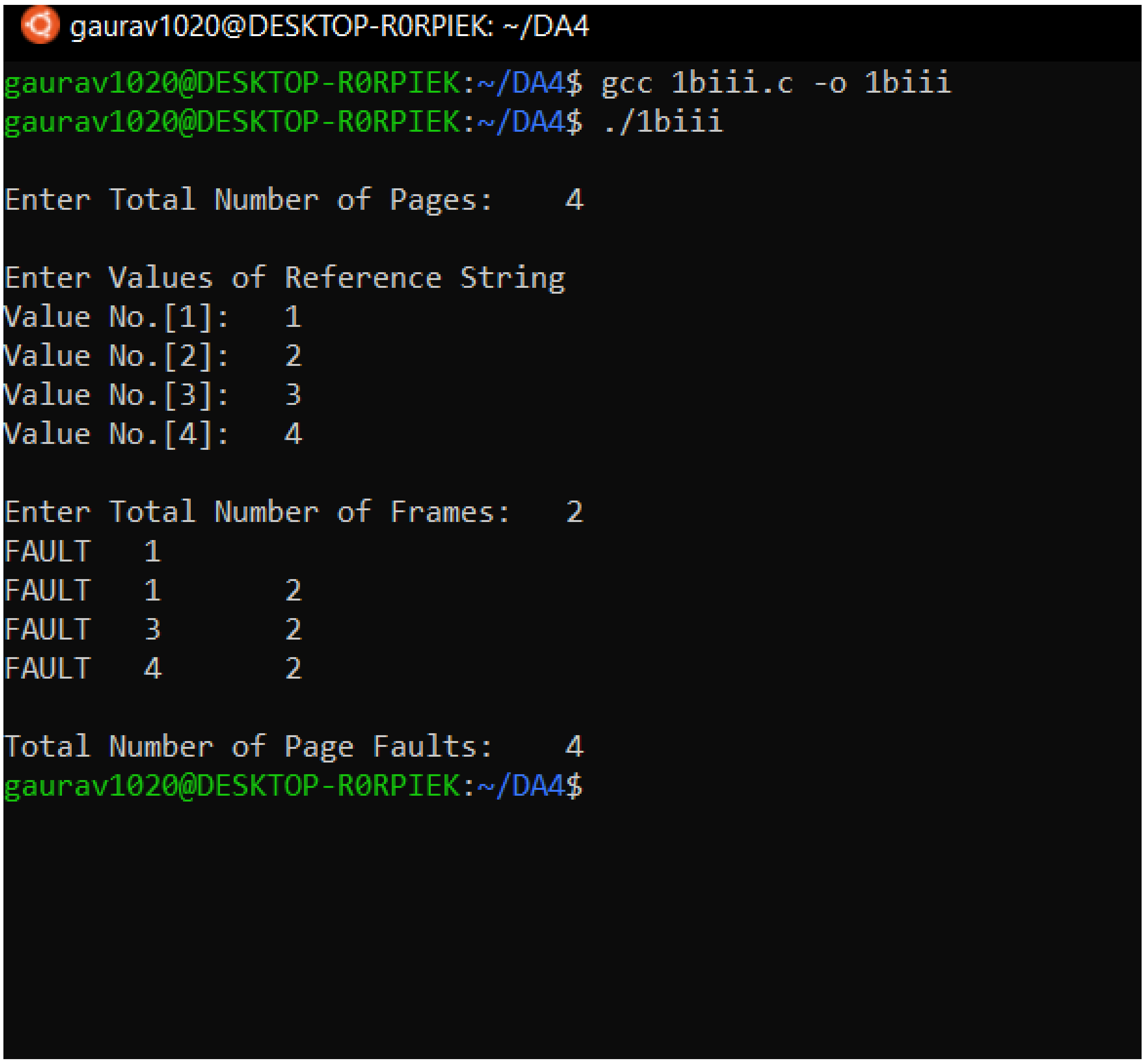


```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 1bii.c -o 1bii
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./1bii

Enter Total Number of Frames:   2
Enter Total Number of Pages:    4
Enter Values for Reference String:
Value No.[1]:   1
Value No.[2]:   2
Value No.[3]:   3
Value No.[4]:   4

1       -1
1       2
3       2
3       4
Total Number of Page Faults:    2
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

iii) **Optimal Page Replacement**

```
#include<stdio.h>
int main()
{
  int reference_string[25], frames[25], interval[25];
  int pages, total_frames,m, n, temp, flag, found, position, maximum_interval, page_faults = 0, previous_frame = 
-1;
  printf("\nEnter Total Number of Pages:\t");
  scanf("%d", & pages);
  printf("\nEnter Values of Reference String\n");
  for (m = 0; m < pages; m++){
    printf("Value No.[%d]:\t", m + 1);
    scanf("%d", & reference_string[m]);
  }
  printf("\nEnter Total Number of Frames:\t");
  scanf("%d", & total_frames);
  for (m = 0; m < total_frames; m++){
    frames[m] = -1;
  }
  for (m = 0; m < pages; m++){
    flag = 0;
    for (n = 0; n < total_frames; n++){
      if (frames[n] == reference_string[m]){
        flag = 1;
        printf("\t");
        break;
      }
    }
    if (flag == 0){
      if (previous_frame == total_frames - 1){
        for (n = 0; n < total_frames; n++){
          for (temp = m + 1; temp < pages; temp++){
            interval[n] = 0;
            if (frames[n] == reference_string[temp]){
              interval[n] = temp - m;
              break;
            }
          }
        }
        found = 0;
        for (n = 0; n < total_frames; n++){
          if (interval[n] == 0){
            position = n;
            found = 1;
            break;
          }
        }
      } else{
        position = ++previous_frame;
        found = 1;
      }
      if (found == 0){
        maximum_interval = interval[0];
        position = 0;
        for (n = 1; n < total_frames; n++){
          if (maximum_interval < interval[n]){
            maximum_interval = interval[n];
            position = n;
          }
        }
      }
      frames[position] = reference_string[m];
      printf("FAULT\t");
      page_faults++;
    }
    for (n = 0; n < total_frames; n++){
      if (frames[n] != -1){
        printf("%d\t", frames[n]);
      }
    }
    printf("\n");
  }
  printf("\nTotal Number of Page Faults:\t%d\n", page_faults);
  return 0;
}
```

OUTPUT



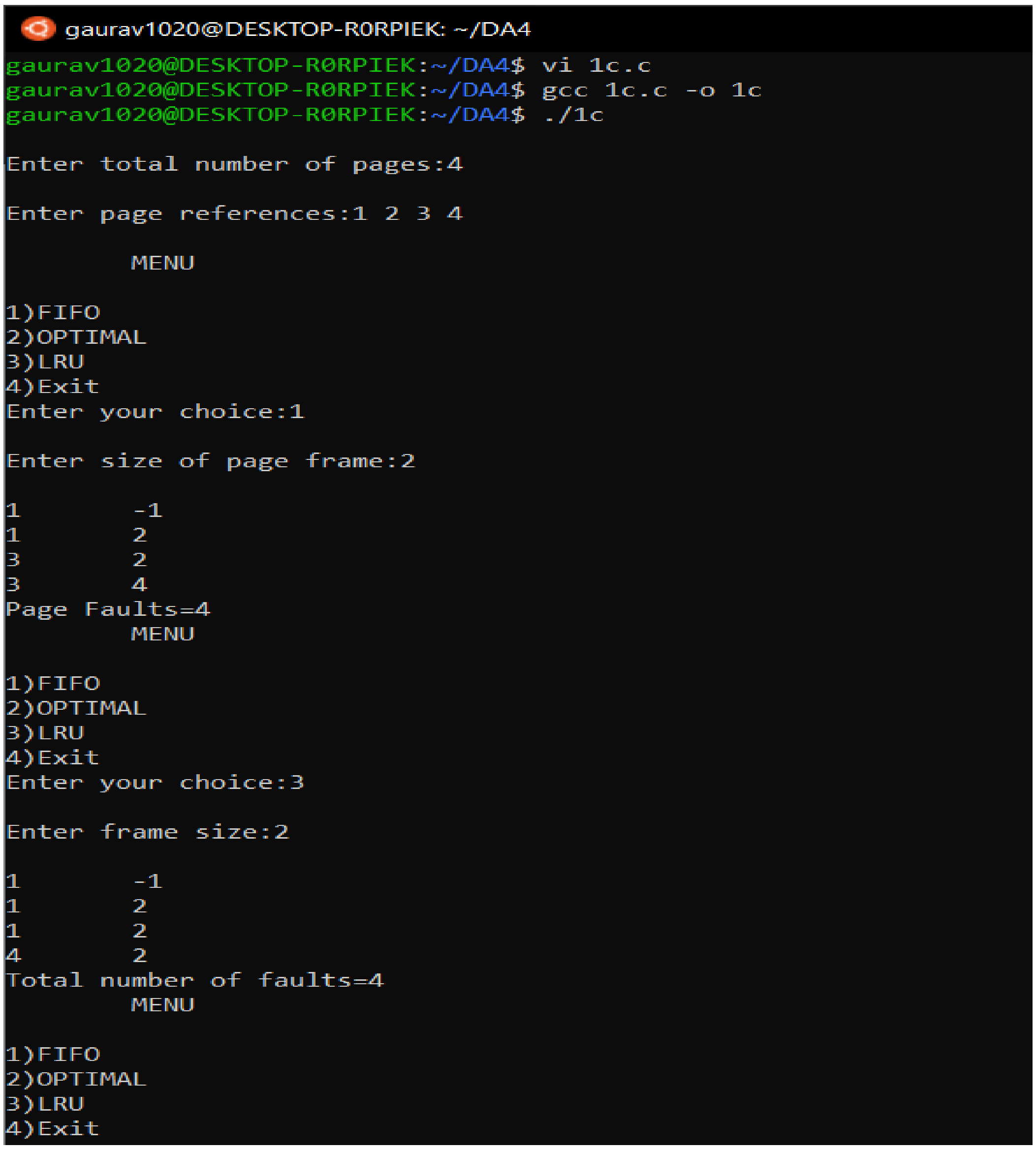
```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 1biii.c -o 1biii
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./1biii

Enter Total Number of Pages:    4

Enter Values of Reference String
Value No.[1]:   1
Value No.[2]:   2
Value No.[3]:   3
Value No.[4]:   4

Enter Total Number of Frames:   2
FAULT   1
FAULT   1       2
FAULT   3       2
FAULT   4       2

Total Number of Page Faults:    4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

(c)

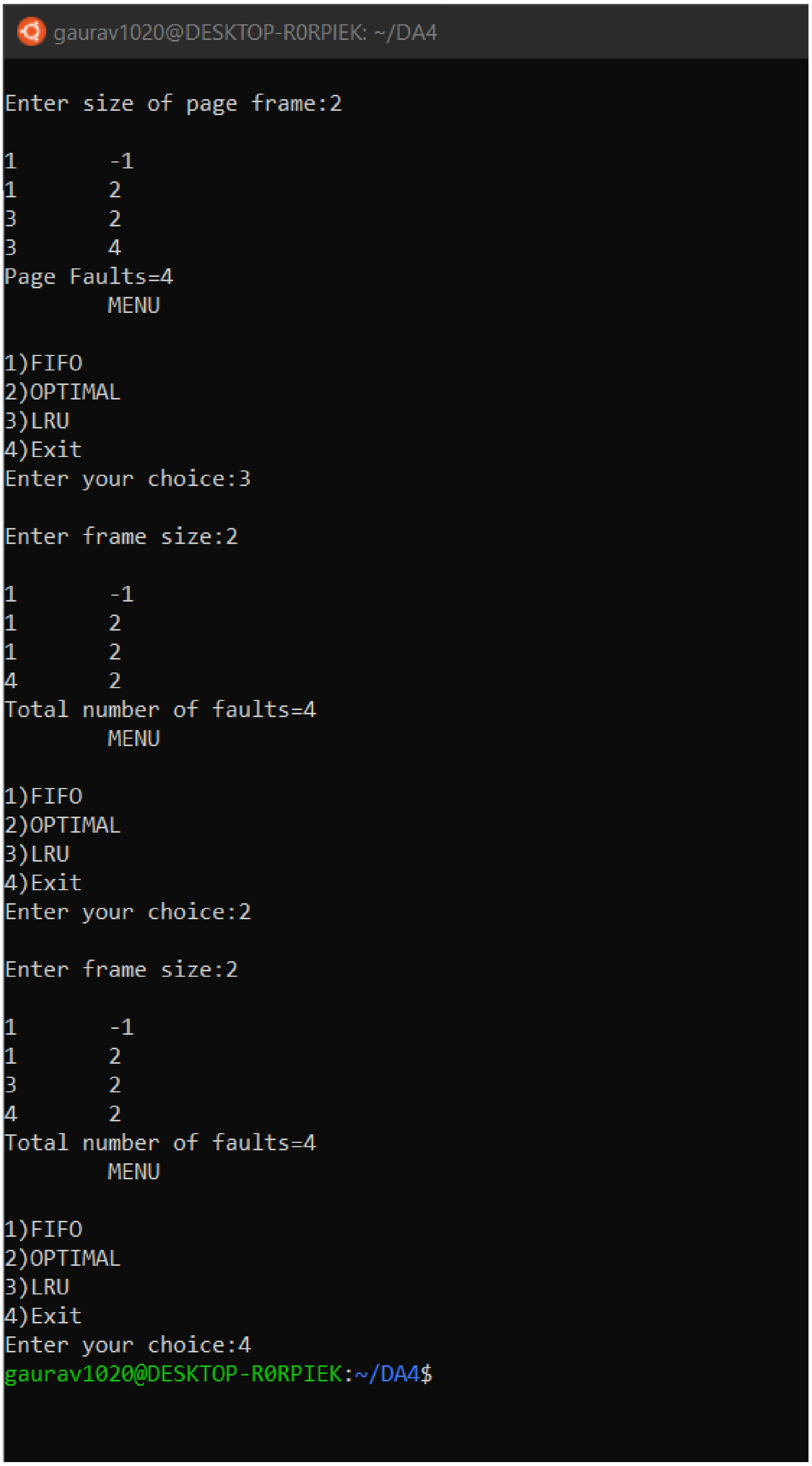
```
#include <stdio.h>
int n, pg[30], fr[10];
void fifo();
void optimal();
void lru();
void main() {
  int i, ch;
  printf("\nEnter total number of pages:");
  scanf("%d", & n);
  printf("\nEnter page references:");
  for (i = 0; i < n; i++)
    scanf("%d", & pg[i]);
  do {
    printf("\n\tMENU\n");
    printf("\n1)FIFO");
    printf("\n2)OPTIMAL");
    printf("\n3)LRU");
    printf("\n4)Exit");
    printf("\nEnter your choice:");
    scanf("%d", & ch);
    switch (ch) {
    case 1:
      fifo();
      break;
    case 2:
      optimal();
      break;
    case 3:
      lru();
      break;
    }
  } while (ch != 4);
  getchar();
}
void fifo() {
  int i, f, r, s, count, flag, num, psize;
  f = 0;
  r = 0;
  s = 0;
  flag = 0;
  count = 0;
  printf("\nEnter size of page frame:");
  scanf("%d", & psize);
  for (i = 0; i < psize; i++) {
    fr[i] = -1;
  }
  while (s < n) {
    flag = 0;
    num = pg[s];
    for (i = 0; i < psize; i++) {
      if (num == fr[i]) {
        s++;
        flag = 1;
        break;
      }
    }
    if (flag == 0) {
      if (r < psize) {
        fr[r] = pg[s];
        r++;
        s++;
        count++;
      } else {
        if (f < psize) {
          fr[f] = pg[s];
          s++;
          f++;
          count++;
        } else
          f = 0;
      }
    }
    printf("\n");
    for (i = 0; i < psize; i++) {
      printf("%d\t", fr[i]);
    }
  }
  printf("\nPage Faults=%d", count);
  getchar();
}
void optimal() {
  int count[10], i, j, k, l, m, p, r, fault, fSize, flag, temp, max, tempflag = 0;
  fault = 0;
  k = 0;
  printf("\nEnter frame size:");
  scanf("%d", & fSize);
  for (i = 0; i < fSize; i++) {
    count[i] = 0;
    fr[i] = -1;
  }
  for (i = 0; i < n; i++) {
    flag = 0;
    temp = pg[i];
    for (j = 0; j < fSize; j++) {
      if (temp == fr[j]) {
        flag = 1;
        break;
      }
    }
    if ((flag == 0) && (k < fSize)) {
      fault++;
      fr[k] = temp;
      k++;
    }
    else if ((flag == 0) && (k == fSize)) {
      fault++;
      for (l = 0; l < fSize; l++) {
        count[l] = 0;
      }
      for (m = 0; m < fSize; m++)
      {
        tempflag = 0;
        for (r = i + 1; r < n; r++) {
          if (fr[m] == pg[r]) {
            if (count[m] == 0)
```

```
              count[m] = r;
            tempflag = 1;
          }
        }
        if (tempflag != 1) {
          count[m] = n + 1;
        }
      }
      p = 0;
      max = count[0];
      for (l = 0; l < fSize; l++) {
        if (count[l] > max) {
          max = count[l];
          p = l;
        }
      }
      fr[p] = temp;
    }
    printf("\n");
    for (l = 0; l < fSize; l++) {
      printf("%d\t", fr[l]);
    }
  }
  printf("\nTotal number of faults=%d", fault);
  getchar();
}
void lru() {
  int count[10], i, j, k, fault, f, flag, temp, current, c, dist, least, m, cnt, p, x;
  fault = 0;
  dist = 0;
  k = 0;
  printf("\nEnter frame size:");
  scanf("%d", & f);
  for (i = 0; i < f; i++) {
    count[i] = 0;
    fr[i] = -1;
  }
  for (i = 0; i < n; i++) {
    flag = 0;
    temp = pg[i];
    for (j = 0; j < f; j++) {
      if (temp == fr[j]) {
        flag = 1;
        count[j] = i;
        break;
      }
    }
    if ((flag == 0) && (k < f)) {
      fault++;
      fr[k] = temp;
      count[k] = i;
      k++;
    }
    else if ((flag == 0) && (k == f)) {
      fault++;
      least = count[0];
      for (m = 0; m < f; m++) {
        if (count[m] < least) {
          least = count[m];
          p = m;
        }
      }
      fr[p] = temp;
      count[p] = i;
      p = 0;
    }
    printf("\n");
    for (x = 0; x < f; x++) {
      printf("%d\t", fr[x]);
    }
  }
  printf("\nTotal number of faults=%d", fault);
  getchar();
}
```

OUTPUT



```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 1c.c
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 1c.c -o 1c
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./1c

Enter total number of pages:4

Enter page references:1 2 3 4

        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
Enter your choice:1

Enter size of page frame:2

1       -1
1       2
3       2
3       4
Page Faults=4
        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
Enter your choice:3

Enter frame size:2

1       -1
1       2
1       2
4       2
Total number of faults=4
        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
```


gaurav1020@DESKTOP-R0RPIEK: ~/DA4

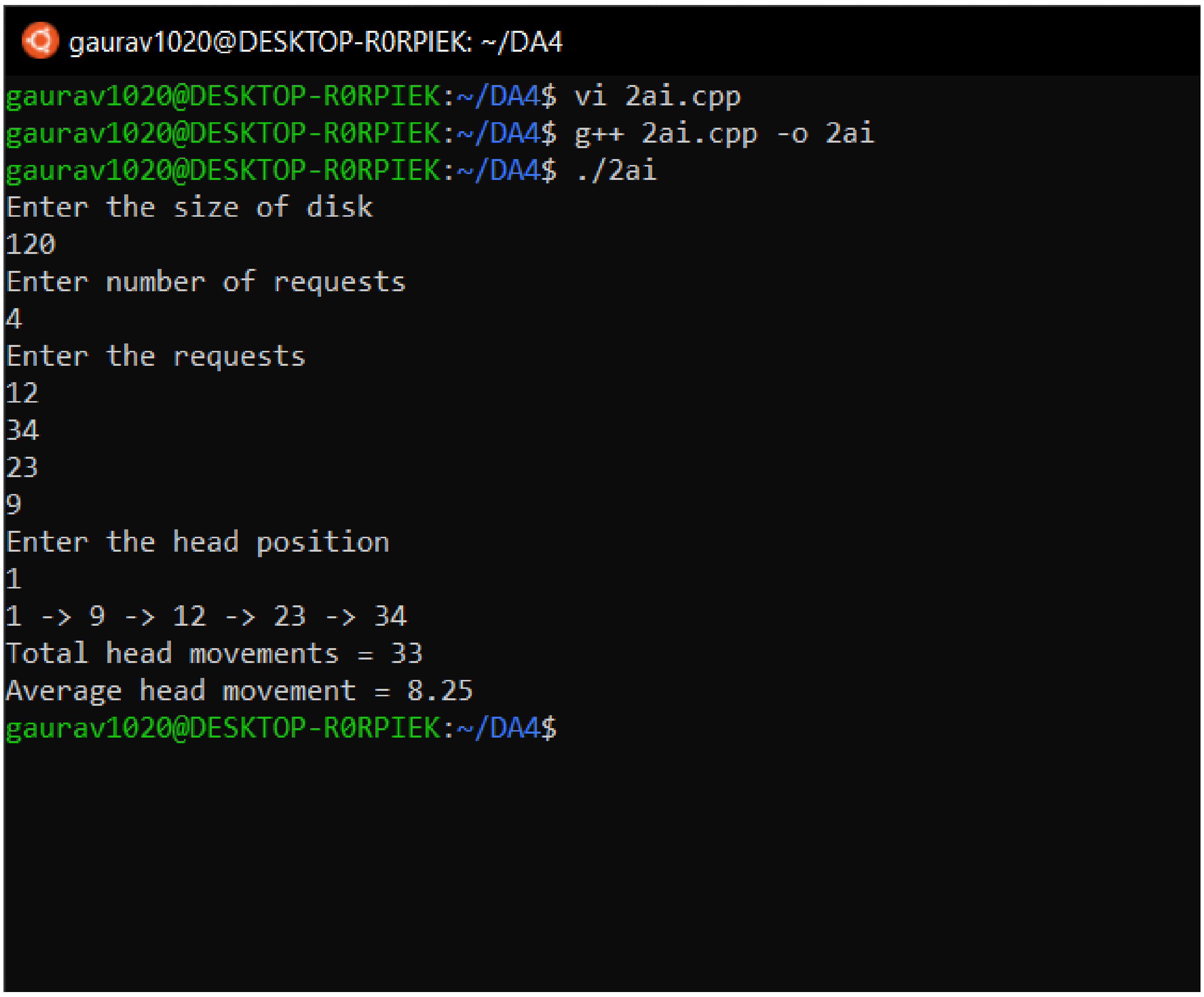
```
Enter size of page frame:2

1       -1
1       2
3       2
3       4
Page Faults=4
        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
Enter your choice:3

Enter frame size:2

1       -1
1       2
1       2
4       2
Total number of faults=4
        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
Enter your choice:2

Enter frame size:2

1       -1
1       2
3       2
4       2
Total number of faults=4
        MENU

1)FIFO
2)OPTIMAL
3)LRU
4)Exit
Enter your choice:4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

2. File System and Disk Management

(a)

i) SSTF

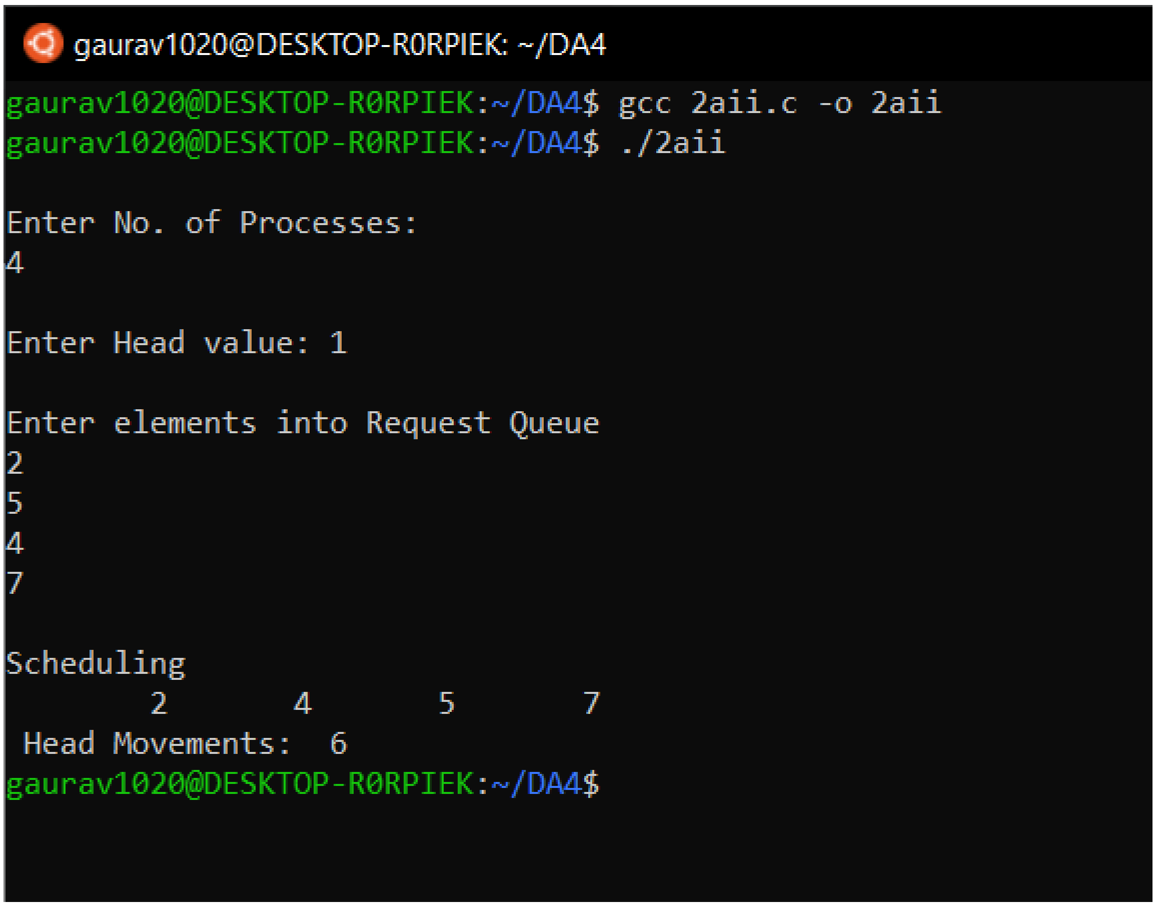
```
#include<bits/stdc++.h>
using namespace std;
int main() {
  int i, j, k, n, m, sum = 0, x, y, h;
  cout << "Enter the size of disk\n";
  cin >> m;
  cout << "Enter number of requests\n";
  cin >> n;
  cout << "Enter the requests\n";
  vector < int > a(n), b;
  map < int, int > mp;
  for (i = 0; i < n; i++) {
    cin >> a[i];
    mp[a[i]]++;
  }
  for (i = 0; i < n; i++) {
    if (a[i] > m) {
      cout << "Error, Unknown position " << a[i] << "\n";
      return 0;
    }
  }
  cout << "Enter the head position\n";
  cin >> h;
  int temp = h;
  int ele;
  b.push_back(h);
  int count = 0;
  while (count < n) {
    int diff = 999999;
    for (auto q: mp) {
      if (abs(q.first - temp) < diff) {
        ele = q.first;
        diff = abs(q.first - temp);
      }
    }
    mp[ele]--;
    if (mp[ele] == 0) {
      mp.erase(ele);
    }
    b.push_back(ele);
    temp = ele;
    count++;
  }
  cout << b[0];
  temp = b[0];
  for (i = 1; i < b.size(); i++) {
    cout << " -> " << b[i];
    sum += abs(b[i] - temp);
    temp = b[i];
  }
  cout << '\n';
  cout << "Total head movements = " << sum << '\n';
  cout << "Average head movement = " << (float) sum / n << '\n';
  return 0;
}
```



```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 2ai.cpp
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ g++ 2ai.cpp -o 2ai
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2ai
Enter the size of disk
120
Enter number of requests
4
Enter the requests
12
34
23
9
Enter the head position
1
1 -> 9 -> 12 -> 23 -> 34
Total head movements = 33
Average head movement = 8.25
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

ii) SCAN

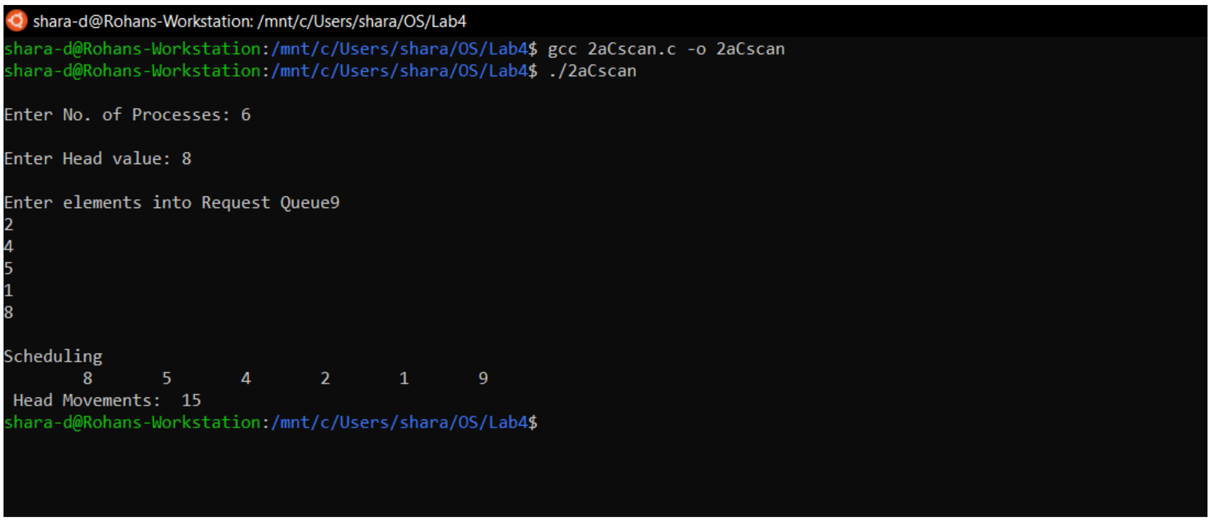
```
#include <stdio.h>
void main(){
  int i, j, n, h, temp = 0, dEnd = 199, hPos, sum = 0, count = 1;
  int rq[100], sq[100];
  printf("\nEnter No. of Processes: ");
  scanf("%d", & n);
  printf("\nEnter Head value: ");
  scanf("%d", & h);
  printf("\nEnter elements into Request Queue");
  for (i = 0; i < n; i++){
    scanf(" %d", & rq[i]);
  }
  rq[i] = h;
  rq[i + 1] = 0;
  for (i = 0; i < n; i++){
    for (j = 0; j < n - 1; j++){
      if (rq[j] > rq[j + 1]){
        temp = rq[j];
        rq[j] = rq[j + 1];
        rq[j + 1] = temp;
      }
    }
  }
  for (i = 0; i < n; i++){
    if (rq[i] > h){
      hPos = i - 1;
      break;
    }
  }
  sq[0] = h;
  printf("\nScheduling\n");
  if (h < (dEnd - h)){
    for (i = hPos; i >= 0; i--){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
    for (i = hPos + 1; i < n; i++){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
  } else{
    for (i = hPos + 1; i < n; i++){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
    for (i = hPos; i >= 0; i--){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
  }
  printf("\n Head Movements: ");
  for (i = 0; i < n; i++){
    if (sq[i] > sq[i + 1]){
      sum += (sq[i] - sq[i + 1]);
    } else{
      sum += (sq[i + 1] - sq[i]);
    }
  }
  printf(" %d \n", sum);
}
```



```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 2aii.c -o 2aii
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2aii

Enter No. of Processes:
4

Enter Head value: 1

Enter elements into Request Queue
2
5
4
7

Scheduling
        2       4       5       7
 Head Movements:  6
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

iii) C-SCAN

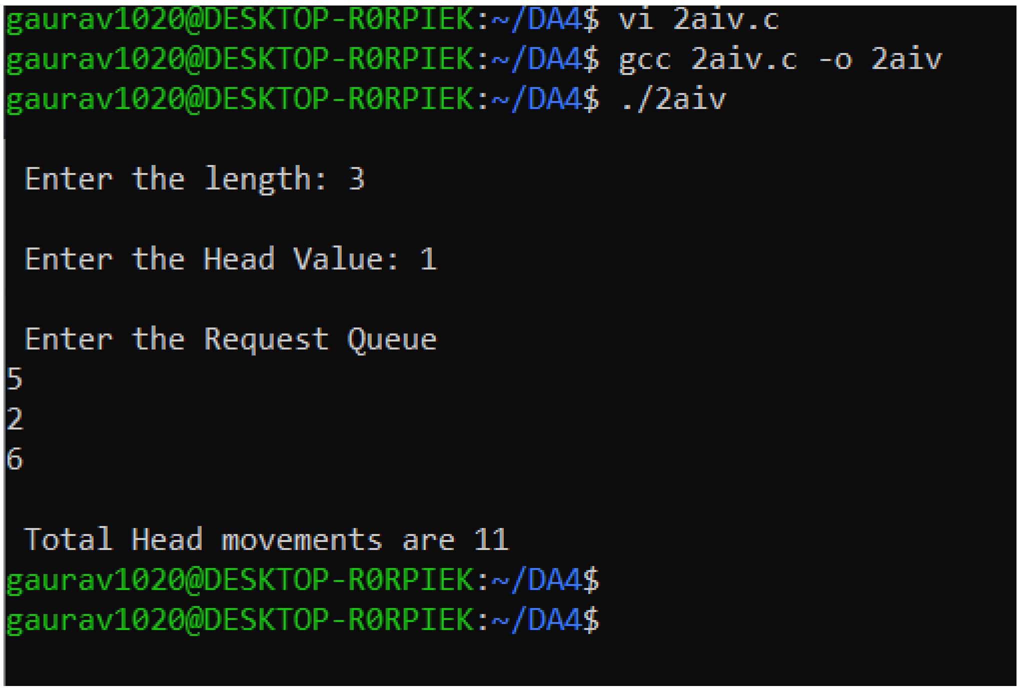
```
#include <stdio.h>
void main(){
  int i, j, n, h, temp = 0, dEnd = 199, hPos, sum = 0, count = 1;
  int rq[100], sq[100];
  printf("\nEnter No. of Processes: ");
  scanf("%d", & n);
  printf("\nEnter Head value: ");
  scanf("%d", & h);
  printf("\nEnter elements into Request Queue");
  for (i = 0; i < n; i++){
    scanf(" %d", & rq[i]);
  }
  rq[i] = h;
  rq[i + 1] = 0;
  for (i = 0; i < n; i++){
    for (j = 0; j < n - 1; j++){
      if (rq[j] > rq[j + 1]){
        temp = rq[j];
        rq[j] = rq[j + 1];
        rq[j + 1] = temp;
      }
    }
  }
  for (i = 0; i < n; i++){
    if (rq[i] > h){
      hPos = i - 1;
      break;
    }
  }
  sq[0] = h;
  printf("\nScheduling\n");
  if (h < (dEnd - h)){
    for (i = hPos; i >= 0; i--){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
    for (i = n - 1; i > hPos; i--){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
  } else{
    for (i = hPos + 1; i < n; i--){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
    for (i = 0; i >= hPos; i++){
      sq[count] = rq[i];
      count++;
      printf("\t%d ", rq[i]);
    }
  }
  printf("\n Head Movements: ");
  for (i = 0; i < n; i++){
    if (sq[i] > sq[i + 1]){
      sum += (sq[i] - sq[i + 1]);
    } else{
      sum += (sq[i + 1] - sq[i]);
    }
  }
  printf(" %d \n", sum);
}
```



```
shara-d@Rohans-Workstation:/mnt/c/Users/shara/OS/Lab4$ gcc 2aCscan.c -o 2aCscan
shara-d@Rohans-Workstation:/mnt/c/Users/shara/OS/Lab4$ ./2aCscan

Enter No. of Processes: 6

Enter Head value: 8

Enter elements into Request Queue9
2
4
5
1
8

Scheduling
        8       5       4       2       1       9
 Head Movements:  15
shara-d@Rohans-Workstation:/mnt/c/Users/shara/OS/Lab4$
```

iv) FCFS

```
#include<stdio.h>
void main(){
  int h, i, rq[100], sum = 0, n, j;
  printf("\n Enter the length: ");
  scanf("%d", & n);
  printf("\n Enter the Head Value: ");
  scanf("%d", & h);
  printf("\n Enter the Request Queue ");
  for (i = 1; i < n + 1; i++){
    scanf("%d", & rq[i]);
  }
  rq[0] = h;
  for (j = 0; j < n; j++){
    if (rq[j] > rq[j + 1]){
      sum = (sum + (rq[j] - rq[j + 1]));
    } else{
      sum = (sum + (rq[j + 1] - rq[j]));
    }
  }
  printf("\n Total Head movements are %d \n", sum);
}
```



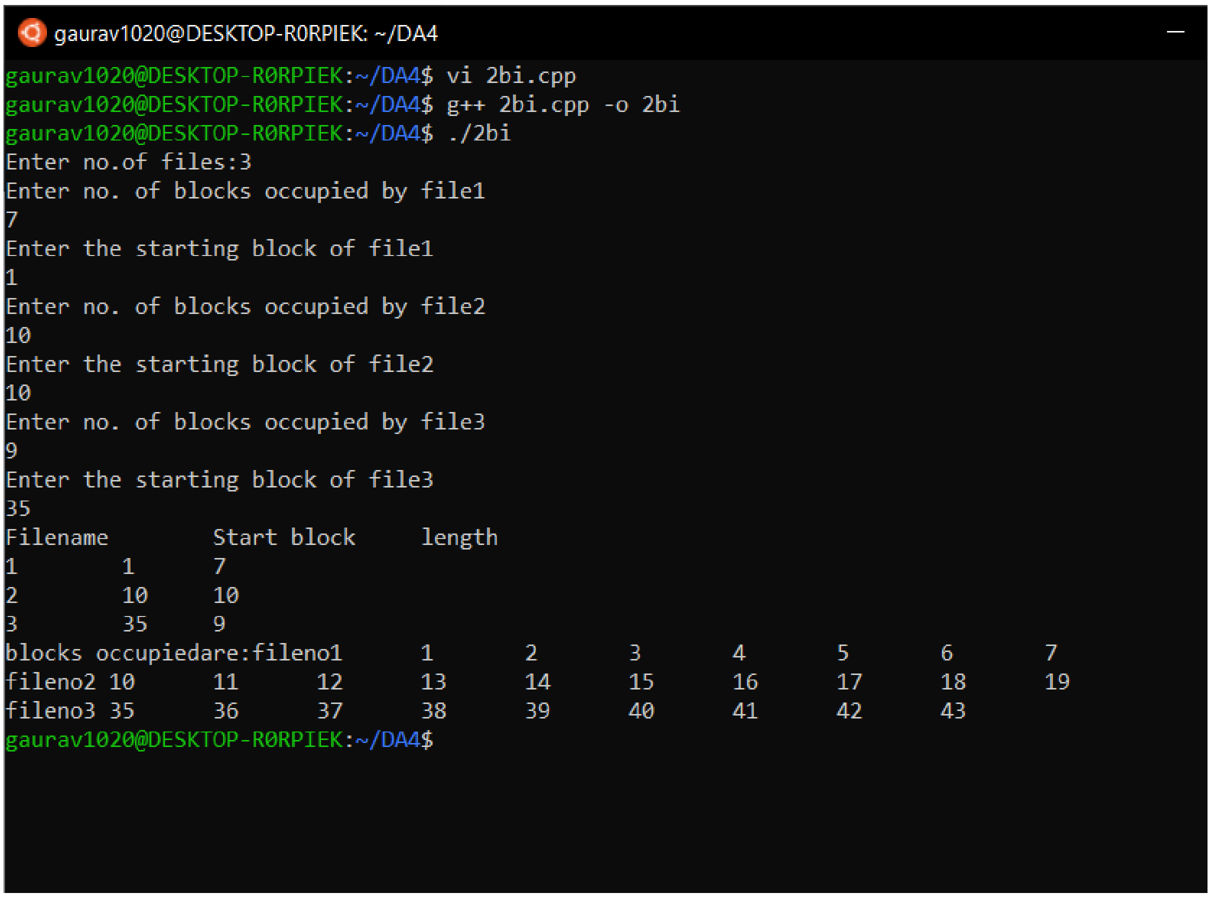
```
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 2aiv.c
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 2aiv.c -o 2aiv
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2aiv

 Enter the length: 3

 Enter the Head Value: 1

 Enter the Request Queue
5
2
6

 Total Head movements are 11
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

(b)

i) Sequential

```
#include<stdio.h>
int main()
```

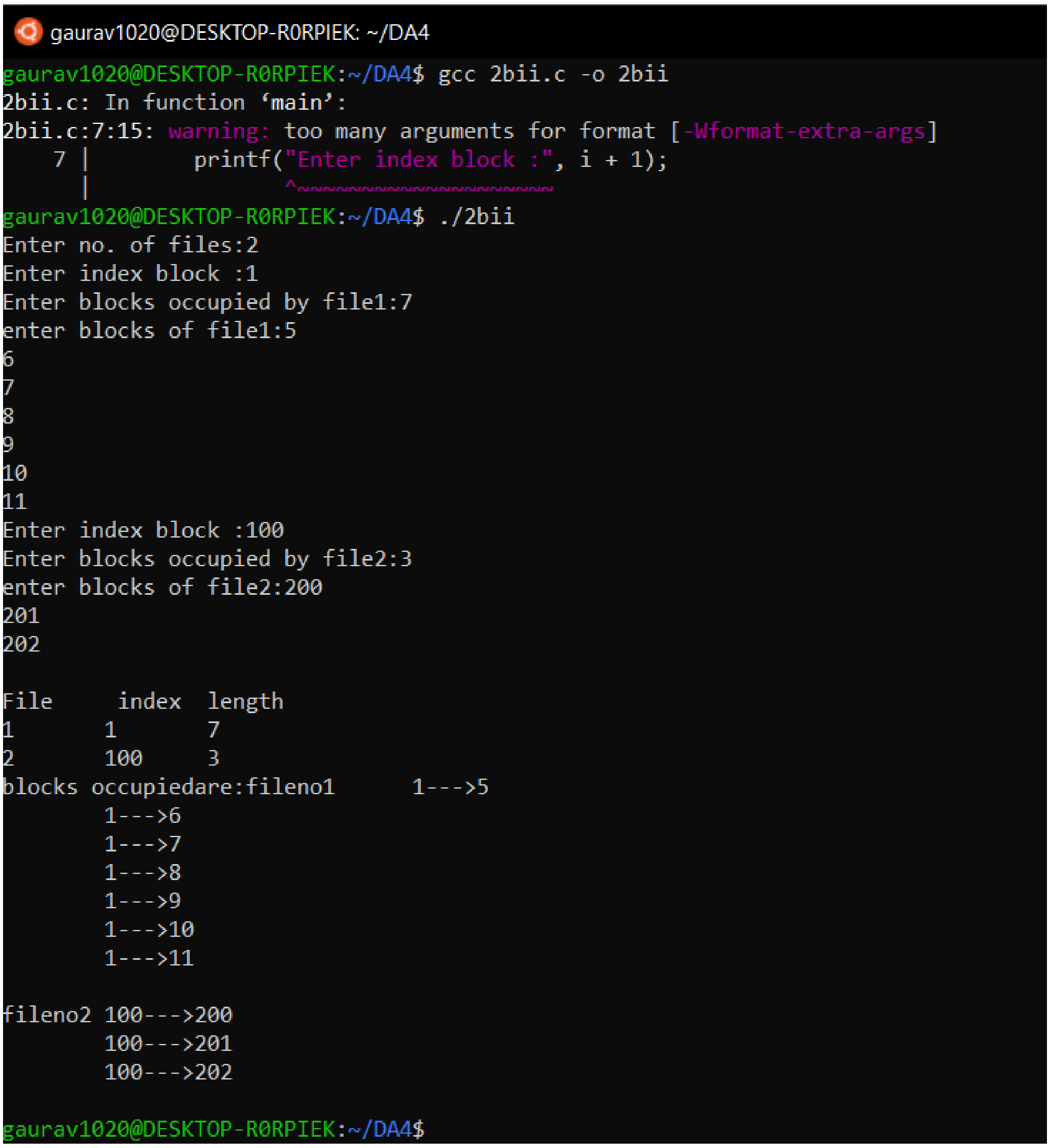
```
{
 int n, i, j, b[20], sb[20], t[20], x, c[20][20];
 printf("Enter no.of files:");
 scanf("%d", & n);
 for (i = 0; i < n; i++){
   printf("Enter no. of blocks occupied by file%d", i + 1);
   scanf("%d", & b[i]);
   printf("Enter the starting block of file%d", i + 1);
   scanf("%d", & sb[i]);
   t[i] = sb[i];
   for (j = 0; j < b[i]; j++){
     c[i][j] = sb[i]++;
   }
 }
 printf("Filename\tStart block\tlength\n");
 for (i = 0; i < n; i++){
   printf("%d\t %d \t%d\n", i + 1, t[i], b[i]);
 }
 printf("blocks occupiedare:");
 for (i = 0; i < n; i++){
   printf("fileno%d", i + 1);
   for (j = 0; j < b[i]; j++){
     printf("\t%d", c[i][j]);
   }
   printf("\n");
 }
 return 0;
}
```



```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 2bi.cpp
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ g++ 2bi.cpp -o 2bi
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2bi
Enter no.of files:3
Enter no. of blocks occupied by file1
7
Enter the starting block of file1
1
Enter no. of blocks occupied by file2
10
Enter the starting block of file2
10
Enter no. of blocks occupied by file3
9
Enter the starting block of file3
35
Filename        Start block     length
1        1      7
2        10     10
3        35     9
blocks occupiedare:fileno1      1       2       3       4       5       6       7
fileno2 10      11      12      13      14      15      16      17      18      19
fileno3 35      36      37      38      39      40      41      42      43
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

ii) Indexed

```
#include<stdio.h>
int main(){
  int n, m[20], i, j, ib[20], b[20][20];
  printf("Enter no. of files:");
  scanf("%d", & n);
  for (i = 0; i < n; i++){
    printf("Enter index block :", i + 1);
    scanf("%d", & ib[i]);
    printf("Enter blocks occupied by file%d:", i + 1);
    scanf("%d", & m[i]);
    printf("enter blocks of file%d:", i + 1);
    for (j = 0; j < m[i]; j++){
      scanf("%d", & b[i][j]);
    }
  }
  printf("\nFile\t index\tlength\n");
  for (i = 0; i < n; i++){
    printf("%d\t%d\t%d\n", i + 1, ib[i], m[i]);
  }
  printf("blocks occupiedare:");
  for (i = 0; i < n; i++){
    printf("fileno%d", i + 1);
    for (j = 0; j < m[i]; j++){
      printf("\t%d--->%d\n", ib[i], b[i][j]);
    }
    printf("\n");
  }
  return 0;
}
```

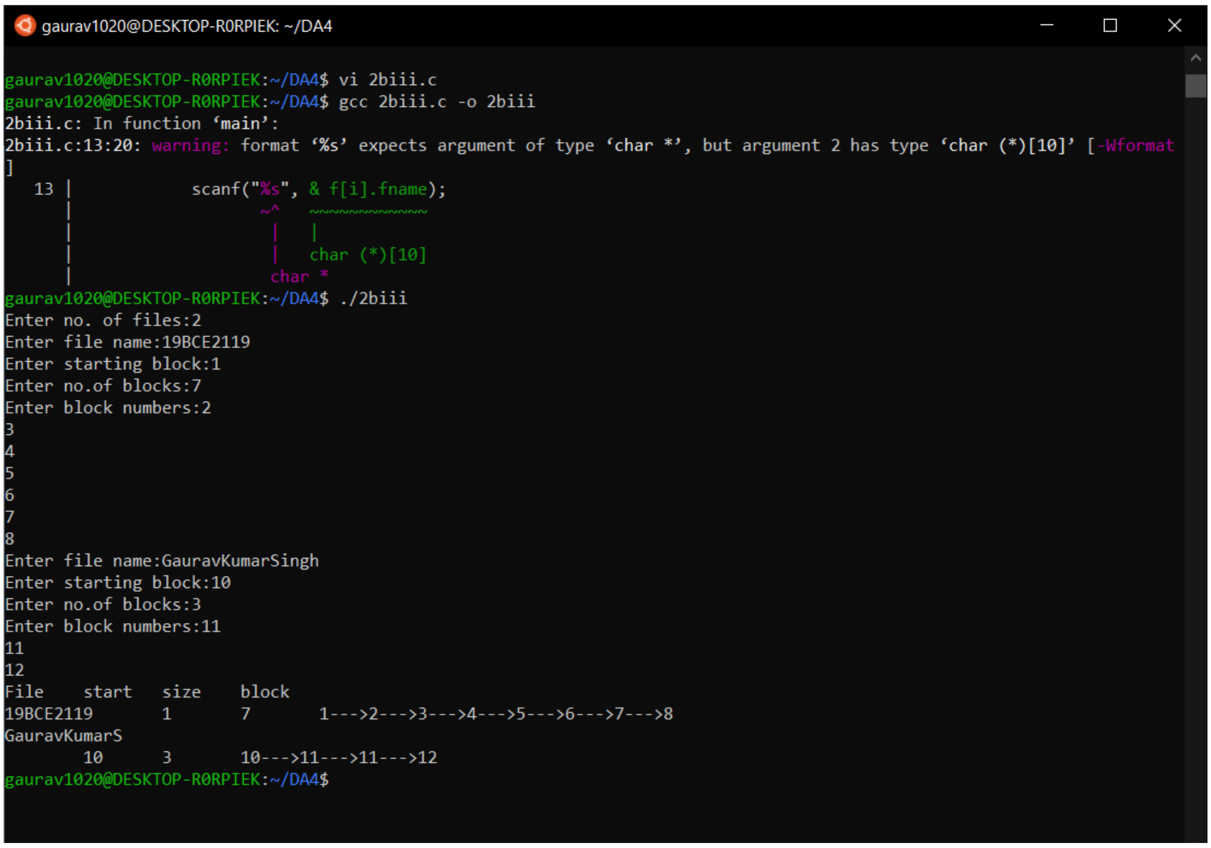


```
gaurav1020@DESKTOP-R0RPIEK: ~/DA4
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 2bii.c -o 2bii
2bii.c: In function ‘main’:
2bii.c:7:15: warning: too many arguments for format [-Wformat-extra-args]
    7 |        printf("Enter index block :", i + 1);
      |               ^~~~~~~~~~~~~~~~~~~~~
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2bii
Enter no. of files:2
Enter index block :1
Enter blocks occupied by file1:7
enter blocks of file1:5
6
7
8
9
10
11
Enter index block :100
Enter blocks occupied by file2:3
enter blocks of file2:200
201
202

File     index  length
1       1       7
2       100     3
blocks occupiedare:fileno1      1--->5
        1--->6
        1--->7
        1--->8
        1--->9
        1--->10
        1--->11

fileno2 100--->200
        100--->201
        100--->202

gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```

iii) Linked

```
#include<stdio.h>
struct file{
 char fname[10];
 int start, size, block[10];
}
f[10];
int main(){
 int i, j, n;
 printf("Enter no. of files:");
 scanf("%d", & n);
 for (i = 0; i < n; i++){
   printf("Enter file name:");
```

```
    scanf("%s", & f[i].fname);
    printf("Enter starting block:");
    scanf("%d", & f[i].start);
    f[i].block[0] = f[i].start;
    printf("Enter no.of blocks:");
    scanf("%d", & f[i].size);
    printf("Enter block numbers:");
    for (j = 1; j <= f[i].size; j++){
      scanf("%d", & f[i].block[j]);
    }
  }
  printf("File\tstart\tsize\tblock\n");
  for (i = 0; i < n; i++){
    printf("%s\t%d\t%d\t", f[i].fname, f[i].start, f[i].size);
    for (j = 0; j < f[i].size; j++){
      printf("%d--->", f[i].block[j]);
    }
    printf("%d", f[i].block[j]);
    printf("\n");
  }
  return 0;
}
```


gaurav1020@DESKTOP-R0RPIEK: ~/DA4

```
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ vi 2biii.c
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ gcc 2biii.c -o 2biii
2biii.c: In function ‘main’:
2biii.c:13:20: warning: format ‘%s’ expects argument of type ‘char *’, but argument 2 has type ‘char (*)[10]’ [-Wformat
]
   13 |             scanf("%s", & f[i].fname);
      |                    ~^   ~~~~~~~~~~~~
      |                     |   |
      |                     |   char (*)[10]
      |                    char *
gaurav1020@DESKTOP-R0RPIEK:~/DA4$ ./2biii
Enter no. of files:2
Enter file name:19BCE2119
Enter starting block:1
Enter no.of blocks:7
Enter block numbers:2
3
4
5
6
7
8
Enter file name:GauravKumarSingh
Enter starting block:10
Enter no.of blocks:3
Enter block numbers:11
11
12
File    start   size    block
19BCE2119       1       7       1--->2--->3--->4--->5--->6--->7--->8
GauravKumarS
        10      3       10--->11--->11--->12
gaurav1020@DESKTOP-R0RPIEK:~/DA4$
```