Ex. No.: 11a)
Date:

FIFO PAGE REPLACEMENT

Aim: To find out the number of page faults that occur using First-in First-out (FIFO) page replacement technique.

Algorithm:
1. Declare the size with respect to page length
2. Check the need of replacement from the page to memory
3. Check the need of replacement from old page to new page in memory 4.
Form a queue to hold all pages
5. Insert the page require memory into the queue
6. Check for bad replacement and page fault
7. Get the number of processes to be inserted
8. Display the values

Program Code:

```
#include<stdio.h>
int main()
{
    int refstr[100], frame[10];
    int refsize, framesize;
    int index=0, initit, if=0;
    printf("Enter size of ref string:");
    scanf("%d", &refsize);
    for(int i=0; i<=refsize; i++){
        printf("Enter [%d]:", i);
        scanf("%d", &refstr[i]);
    }
    printf("Enter page frame size:");
    scanf("%d", &framesize);
    for(int i=0; i<refsize; i++){
        initit=0;
        for(int j=0; j<framesize; j++)
            if(frame[j]==refstr[i])
```

```
                isHit=1;
                break;
            }
        }
        if(!isHit){
            frame[indexc] = refstrn[i];
            indexc = (indexc+1) % framesize;
            pf++;
            printf("\n%d -> ", refstrn[i]);
        }
        for(int k=0; k<framesize; k++){
            if(frame[k] != -1)
                printf("%d", frame[k]);
        }
        printf("\n");
        else{
            printf("\n%d -> No of Page fault\n
                , refstrn[i]);
        }
    }
    printf("\n Total page faults : %d \n", pf);
    return 0;
}
```

Sample Output:

```
[root@localhost student]# python fifo.py

Enter the size of reference string: 20
Enter [ 1] : 7
Enter [ 2] : 0
Enter [ 3] : 1
Enter [ 4] : 2
Enter [ 5] : 0
Enter [ 6] : 3
Enter [ 7] : 0
Enter [ 8] : 4
Enter [ 9] : 2
Enter [10] : 3
Enter [11] : 0
Enter [12] : 3
Enter [13] : 2
Enter [14] : 1
Enter [15] : 2
Enter [16] : 0
Enter [17] : 1
Enter [18] : 7
Enter [19] : 0
Enter [20] : 1

Enter page frame size : 3

7 -> 7 - -
0 -> 7 0 -
1 -> 7 0 1
2 -> 2 0 1
0 -> No Page Fault


3 -> 2 3 1
0 -> 2 3 0
4 -> 4 3 0
2 -> 4 2 0
3 -> 4 2 3
0 -> 0 2 3
3 -> No Page Fault
2 -> No Page Fault
1 -> 0 1 3
2 -> 0 1 2
0 -> No Page Fault
1 -> No Page Fault
7 -> 7 1 2
0 -> 7 0 2
```

1->7 0 1
Total page faults: 15.
[root@localhost student]#

Output :-

Enter the size of ref string : 7

Enter page frame size: 3

Enter [1] : 1

Enter [2] : 3

Enter [3] : 0

Enter [4] : 3

Enter [5] : 5

Enter [6] : 6

Enter [7] : 3

1 -> 1

3 -> 1 3

0 -> 1 3 0

3 -> No Page fault

5 -> 5 3 0

6 -> 5 6 0

3 -> 5 6 3

Result :

Hence, the program for finding the page fault using FIFO replacement has been executed successfully.

Ex. No.: 11b)
Date:

LRU

Aim: To write a c program to implement LRU page replacement algorithm.

Algorithm:
1: Start the process
2: Declare the size
3: Get the number of pages to be inserted
4: Get the value
5: Declare counter and stack
6: Select the least recently used page by counter value
7: Stack them according the selection.
8: Display the values
9: Stop the process

Program Code:

```
#include<stdio.h>
int main()
{
    int refstr[100], frame[20], recent[20];
    int refsize, framesize;
    int i, j, k, time=0, pf=0, isHit, index;
    printf("Enter the number of pages:");
    scanf("%d", &refsize);
    for(int i=0; i<refsize; i++)
    {
        printf("[%d]", i+1);
        scanf("%d", &refstr[i]);
    }
    printf("Enter page Frame size:");
    scanf("%d", &framesize);
    for(i=0; i<framesize; i++)
    {
        frame[i]=-1;
        recent[i]=-1;
    }
    printf("\n");
```

```
for(int i=0; i<refsize; i++){
    isHit=0;
    for(int j=0; j<framesize; j++){
        if(frames[j] == refstr[i]){
            isHit=1;
            recent[j] = time++;
            break;
        }
    }
    if(isHit){
        printf("%2d -> No of Page Fault in", refstr[i]);
        continue;
    }
    int emptyind = -1;
    for(j=0; j<framesize; j++){
        if(frame[j] == -1){
            emptyind = j;
            break;
        }
    }
    if(emptyind != -1){
        frames[emptyind] = refstr[i];
        recent[emptyind] = time++;
    }
```

```
else {
    int min = recent[0];
    cru_index = 0;
    for(j=1; j<framesize; j++) {
        if (recent[j] < min) {
            min = recent[j];
            cruindex = j;
        }
    }
    frame[cru_index] = refstr[i];
    recent[cru_index] = time++;
}
ff++;
printf("%.2d ->", refstr[i]);
for(int k=0; k<framesize; k++) {
    if(frame[k] != -1) {
        printf("%d", frame[k]);
    }
}
printf("-> Page fault \n");
}
printf("\n Total Page faults: %d\n", ff);
}
```

Output :-

Enter number of pages: 14

Enter page frame = 4

Enter [1] = 7

Enter [2] = 0

Enter [3] = 1

Enter [4] = 2

Enter [5] = 0

Enter [6] = 3

Enter [7] = 0

Enter [8] = 4

Enter [9] = 2

Enter [10] = 3

Enter [11] = 0

Enter [12] = 3

Enter [13] = 2

Enter [14] = 3

7 → 7 ⇒ Page Fault

0 → 7 0 ⇒ Page Fault

1 → 7 0 1 ⇒ Page Fault

2 → 7 0 1 2 ⇒ Page Fault

0 → No Page fault

4 → 3 0 4 2 ⇒ Page Fault

2 → No Page Fault

4 → "

2 → "

3 → "

0 → "

3 → "

2 → "

3 → "

Total Page Fault : 6

Sample Output :

```
Enter number of frames: 3
Enter number of pages: 6
Enter reference string: 5 7 5 6 7 3
5 -1 -1
5 7 -1
5 7 -1
5 7 6
5 7 6
3 7 6
Total Page Faults = 4
```

Result:

Hence, program for finding the page fault using LRU page replacement technique is implemented successfully.

Ex. No.: 11c)
Date:

Optimal

Aim:
To write a c program to implement Optimal page replacement algorithm.

ALGORITHM:

1. Start the process
2. Declare the size
3. Get the number of pages to be inserted
4. Get the value
5. Declare counter and stack
6. Select the least frequently used page by counter value
7. Stack them according the selection.
8. Display the values
9. Stop the process

PROGRAM:

```
#include<stdio.h>
int main()
{
    int refstr[100], frame[10];
    int m,f, i, j, k, pagefault=0, hit;
    printf("Enter the size of reference string:");
    scanf("%d",&m);
    for(i=0;i<m;i++)
    {
        printf("Enter [%d]:",i+1);
        scanf("%d",&refstr[i]);
    }
    printf("Enter page frame size:");
    scanf("%d",&f);
    for(i=0;i<f;i++)
        frame[i]=-1;
```

```
printf("\n");
for(i=0;i<w;i++){
    hit=0;
    for(i=0;i<f;i++){
        hit=0;
        for(j=0;j<f;j++){
            if(frames[j]==
                    refstr[i]){
                hit=1;
                break;
            }
        }
        if(hit){
            printf("%d %d -> 
                No of Page Fault
                \n", refstr[i]);
            continue;
        }
        if(empty!=-1){
            frames[empty]=refstr
                [i];
        }
        else{
            int farthest=-1, idx=-1;
            for(j=0;j<f;j++){
                int found=0;
```

```
for(k=i+1;k<w;k++){
    if(frames[j]==refstr[k]){
        found=1;
        if(k>farthest){
            farthest=k;
            idx=j;
        }
        break;
    }
}
if(!found){
    idx=i;
    break;
}
}
frames[idx]=refstr[i];

pagefault++;
printf("%d->",refstr[i]);
for(k=0;k<f;k++){
    if(frames[k]!=-1)
        printf("%d",frames[k]);
}
printf("->Page Fault\n");
}
printf("\n Total Page Faults : %d",pagefaults);
}
```

Output:

Enter the size of reference string : 10

Enter page frame

Enter [1] : 7
Enter [2] : 0
Enter [3] : 1
Enter [4] : 2
Enter [5] : 0
Enter [6] : 3
Enter [7] : 0
Enter [8] : 4
Enter [9] : 2
Enter [10] : 3

7 → 7 ⇒ page fault
0 → 7 0 ⇒ Page fault
1 → 7 0 1 ⇒ Page fault
2 → 2 0 1 ⇒ Page fault
0 → NO page fault
3 → 2 0 3 ⇒ Page fault
0 → 2 0 3 ⇒ page fault
4 ⇒ 2 4 3 ⇒ page fault
2 ⇒ NO Page fault
3 ⇒ NO page fault

Total Page faults : 6
Total Page hit : 4

Result:

Thus program for finding ~~find~~ page faults using optimal page replacement technique is implemented successfully.