Exp 11c)

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

Program Code:

```c
#include <stdio.h>

int isPresent(int pages[], int frame[], int n) {
    for (int i = 0; i < n; i++) {
        if (frame[i] == pages[i])
            return 1;
    }
    return 0;
}

int predict(int pages[], int frame[], int n, int index, int frames) {
    int res = -1, farthest = index;
    for (int i = 0; i < frames; i++) {
        int j;
        for (j = index; j < n; j++) {
            if (frame[i] == pages[j]) {
                if (j > farthest) {
                    farthest = j;
                    res = i;
                }
                break;
            }
        }

        // If the page never appears again
        if (j == n)
            return i;
    }
    return (res == -1) ? 0 : res;
}

int main() {
    int n, frames;
    int pages[100], frame[10];
    int pageFaults = 0, k = 0;

    printf("Enter number of pages: ");
    scanf("%d", &n);

    printf("Enter the page reference string:\n");
    for (int i = 0; i < n; i++)
        scanf("%d", &pages[i]);

    printf("Enter number of frames: ");
    scanf("%d", &frames);

    for (int i = 0; i < frames; i++)
        frame[i] = -1;

    printf("\nPage\tFrames\t\tPage Fault\n");
```

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

    for (int j = 0; j < frames; j++) {
        if (frame[j] == pages[i]) {
            flag = 1;
            break;
        }
    }

    if (!flag) {
        if (k < frames) {
            frame[k++] = pages[i];
        } else {
            int pos = predict(pages, frame, n, i + 1, frames);
            frame[pos] = pages[i];
        }
        pageFaults++;
    }

    printf("%d\t", pages[i]);
    for (int j = 0; j < frames; j++) {
        if (frame[j] != -1)
            printf("%d ", frame[j]);
        else
            printf("- ");
    }
    printf("\t\t%s\n", flag ? "No" : "Yes");
}

printf("\nTotal Page Faults = %d\n", pageFaults);
return 0;
```

Output:

```
Enter number of pages: 12
Enter the page reference string:
7 0 1 2 0 3 0 4 2 3 0 3
Enter number of frames: 4

Page    Frames          Page Fault
7       7 - - -                 Yes
0       7 0 - -                 Yes
1       7 0 1 -                 Yes
2       7 0 1 2                 Yes
0       7 0 1 2                 No
3       3 0 1 2                 Yes
0       3 0 1 2                 No
4       3 0 4 2                 Yes
2       3 0 4 2                 No
3       3 0 4 2                 No
0       3 0 4 2                 No
3       3 0 4 2                 No

Total Page Faults = 6
```