FIFO PAGE REPLACEMENT

Aim:

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

Program code:

```c
#include <stdio.h>
#define MAX
50 int main() {
    int referenceString[MAX], pageFrame[MAX],
  pageFaults = 0; int frames, referenceLength;

    // Input reference string length and the
  string itself printf("Enter the size of reference
  string: "); scanf("%d", &referenceLength);

    printf("Enter the reference
  string:\n"); for (int i = 0; i <
  referenceLength; i++) {
        printf("Enter [%d]: ", i + 1);
    scanf("%d",
    &referenceString[i]);
    }

    // Input number of frames
  printf("Enter page frame
  size: "); scanf("%d",
  &frames);

    // Initialize the page frame array to -1
  (empty) for (int i = 0; i < frames; i++) {
        pageFrame[i] = -1;
    }
    // FIFO page replacement
    int front = 0; // Points to the oldest page in

  the frame for (int i = 0; i < referenceLength;
  i++) {
        int page =
    referenceString[i]; int
    found = 0;

        // Check if page is already
    in frame for (int j = 0; j <
    frames; j++) {
                if
```

```
(pageFrame[j]  ==
page) { found = 1;
        break;
```

```c
            }
        }
        // If the page is not found in frame, perform page
replacement if (!found) {
            pageFrame[front] =
    page; pageFaults++;

            // Move the front pointer (FIFO
    replacement) front = (front + 1) %
    frames;
        }
        // Print the current state of the page
frame printf("%d -> ", page);
        for (int j = 0; j <
    frames; j++) { if
    (pageFrame[j] != -1) {
                printf("%d ", pageFrame[j]);
            } else {
                printf("- ");
            }
        }
        printf("\n");
    }
    printf("\nTotal page faults: %d\n", pageFaults);

    return 0;

}
```

OUTPUT :

```
3 -> 0 2 3
2 -> 0 2 3
1 -> 0 1 3
2 -> 0 1 2
0 -> 0 1 2
1 -> 0 1 2
7 -> 7 1 2
0 -> 7 0 2
1 -> 7 0 1

Total page faults: 15
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 -> 2 0 1
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 -> 0 2 3
2 -> 0 2 3
1 -> 0 1 3
```

LRU

Aim:

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

Program code :

```c
#include <stdio.h>


#define MAX 50

int main() {
    int referenceString[MAX], pageFrame[MAX],
  pageFaults = 0; int frames, referenceLength;

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

    // Input number of pages and the reference
  string printf("Enter number of pages: ");
    scanf("%d", &referenceLength);

    printf("Enter reference string: ");

      for (int i = 0; i <
    referenceLength; i++)
    { scanf("%d",
    &referenceString[i]);
    }
    // Initialize the page frame array to -1

  (empty) for (int i = 0; i < frames; i++) {
        pageFrame[i] = -1;
    }
    // LRU page replacement

      for (int i = 0; i <
    referenceLength; i++) { int
    page = referenceString[i];
        int found = 0;

        // Check if the page is already in
    the frame for (int j = 0; j < frames; j+
    +) {
              if
        (pageFrame[j] ==
        page) { found = 1;
                break;
```

```
        }
    }
```

```c
        // If the page is not found, replace the least
    recently used page if (!found) {
            // Shift pages in the frame to
        the left (LRU) for (int j = 0; j < frames -
        1; j++) {
                    pageFrame[j] = pageFrame[j + 1];
                }
                pageFrame[frames - 1]
        = page; pageFaults++;
            }

        // Print the current state of the page

    frame printf("\n");
            for (int j = 0; j < frames;
        j++) { printf("%d ",
        pageFrame[j]);
            }
        }

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

    return 0;

}
```

OUTPUT :

```
Enter number of frames: 3
Enter number of pages: 6
Enter reference string: 5
7
5
6
7
3

-1 -1 5
-1 5 7
-1 5 7
5 7 6
5 7 6
7 6 3
Total Page Faults = 4
```

Optimal

Aim:

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

Program code :

```c
#include <stdio.h>


#define MAX 50

// Function to find the index of the page that will not be used for the longest time
int optimalPage(int referenceString[], int pageFrame[], int referenceLength, int frames, int currentIndex) {
    int farthest = currentIndex; int
  replaceIndex = -1;

    for (int i = 0; i <
  frames; i++) { int j;
        for (j = currentIndex; j <
    referenceLength; j++) { if
    (pageFrame[i] == referenceString[j]) {
                    if (j >
      farthest)
      { farthest = j;
      replaceIndex =
      i;
                }
                break;
            }
        }
        if (j == referenceLength) {
            return i; // If a page will not be used later, replace it
        }
    }
    return replaceIndex;
}
int main() {

    int referenceString[MAX], pageFrame[MAX],
  pageFaults = 0; int frames, referenceLength;

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

```c
    // Input number of pages and the reference
string printf("Enter number of pages: ");
    scanf("%d", &referenceLength);
```

```c
    printf("Enter reference string: ");
        for (int i = 0; i <
    referenceLength; i++)
    { scanf("%d",
    &referenceString[i]);
    }

    // Initialize the page frame array to -1

  (empty) for (int i = 0; i < frames; i++) {
        pageFrame[i] = -1;
    }
    // Optimal page replacement

        for (int i = 0; i <
    referenceLength; i++) { int
    page = referenceString[i];
        int found = 0;

        // Check if the page is already in
    the frame for (int j = 0; j < frames; j+
    +) {
                if
        (pageFrame[j] ==
        page) { found = 1;
                break;
            }
        }

        // If the page is not found, replace the
    optimal page if (!found) {
        int replaceIndex = optimalPage(referenceString, pageFrame,
referenceLength, frames, i);
                pageFrame[replaceIndex] = page;
        pageFaults++;
        }

        // Print the current state of the page
    frame printf("\n");
            for (int j = 0; j < frames;
    j++) { printf("%d ",
    pageFrame[j]);
        }
    }

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

    return 0;

}
```

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
6 7 -1
6 7 -1
3 7 -1
Total Page Faults = 4
```