**Optimal Replacement:**

**Code:**

import java.io.BufferedReader;

import java.io.IOException;

import java.io.InputStreamReader;

public class OptimalReplacement {

public static void main(String[] args) throws IOException {

BufferedReader br = new BufferedReader(new InputStreamReader(System.in));

int frames, pointer = 0, hit = 0, fault = 0, ref\_len;

boolean isFull = false;

int buffer[];

int reference[];

int mem\_layout[][];

System.out.println("Please enter the number of Frames: ");

frames = Integer.parseInt(br.readLine());

System.out.println("Please enter the length of inputs: ");

ref\_len = Integer.parseInt(br.readLine());

reference = new int[ref\_len];

mem\_layout = new int[ref\_len][frames];

buffer = new int[frames];

for (int j = 0; j < frames; j++)

buffer[j] = -1;

System.out.println("Please enter inputs: ");

for (int i = 0; i < ref\_len; i++) {

reference[i] = Integer.parseInt(br.readLine());

}

System.out.println();

for (int i = 0; i < ref\_len; i++) {

int search = -1;

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

if (buffer[j] == reference[i]) {

search = j;

hit++;

break;

}

}

if (search == -1)

{

if (isFull) {

int index[] = new int[frames];

boolean index\_flag[] = new boolean[frames];

for (int j = i + 1; j < ref\_len; j++) {

for (int k = 0; k < frames; k++) {

if ((reference[j] == buffer[k]) && (index\_flag[k] == false)) {

index[k] = j;

index\_flag[k] = true;

break;

}

}

}

int max = index[0];

pointer = 0;

if (max == 0)

max = 200;

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

if (index[j] == 0)

index[j] = 200;

if (index[j] > max) {

max = index[j];

pointer = j;

}

}

}

buffer[pointer] = reference[i];

fault++;

if (!isFull) {

pointer++;

if (pointer == frames) {

pointer = 0;

isFull = true;

}

}

}

for (int j = 0; j < frames; j++)

mem\_layout[i][j] = buffer[j];

}

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

for (int j = 0; j < ref\_len; j++)

System.out.printf("%3d ", mem\_layout[j][i]);

System.out.println();

}

System.out.println("The number of Hits: " + hit);

System.out.println("Hit Ratio: " + (float) ((float) hit / ref\_len));

System.out.println("The number of Faults: " + fault);

}

}

**Output:**

Please enter the number of Frames:

5

Please enter the length of inputs:

3

Please enter inputs:

4

8

2

4 4 4

-1 8 8

-1 -1 2

-1 -1 -1

-1 -1 -1

The number of Hits: 0

Hit Ratio: 0.0

The number of Faults: 3