Lab Assignment: 02

Title: Implement different page replacement algorithms (FIFO, Optimal, LRU) using c.

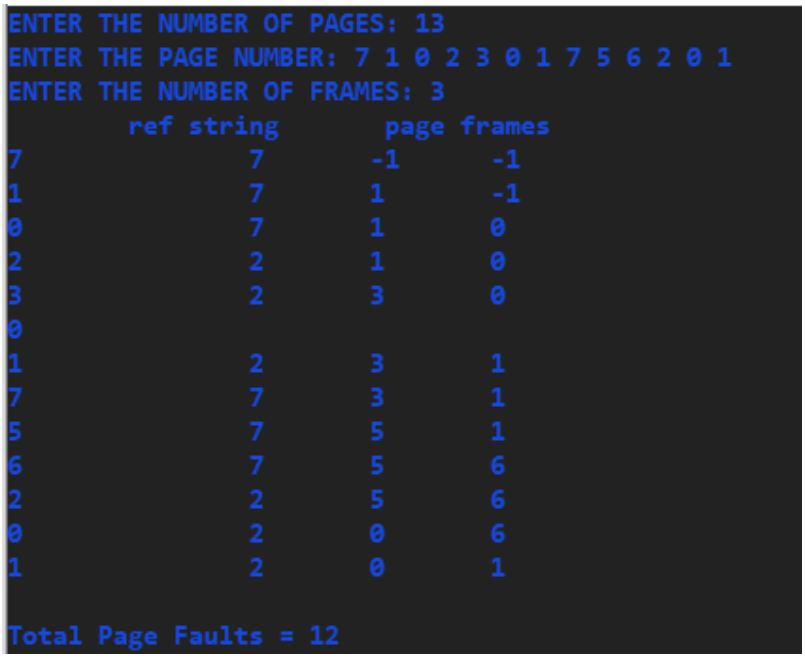
FIFO Theory: This is the simplest page replacement algorithm. In this algorithm, the operating system keeps track of all pages in the memory in a queue, the oldest page is in the front of the queue. When a page needs to be replaced page in the front of the queue is selected for removal.

Code:

```
#include<stdio.h>
int main()
{
   int i,j,n,a[50],frame[10],no,k,avail,count=0;
   printf("ENTER THE NUMBER OF PAGES: ");
   scanf("%d",&n);
   printf("ENTER THE PAGE NUMBER: ");
   for(i=1; i<=n; i++)
      scanf("%d",&a[i]);
   printf("ENTER THE NUMBER OF FRAMES: ");
   scanf("%d",&no);
   for(i=0; i<no; i++)
      frame[i]= -1;
   j=0;
   printf("\tref string\t page frames\n");
   for(i=1; i<=n; i++)
   {
      printf("%d\t\t",a[i]);
      avail=0;
      for(k=0; k<no; k++)
         if(frame[k]==a[i])
            avail=1;
      if (avail==0)
      {
         frame[j]=a[i];
         j=(j+1)%no;
```

```
            count++;
            for(k=0; k<no; k++)
                printf("%d\t",frame[k]);
        }
        printf("\n");
    }
    printf("\nTotal Page Faults = %d",count);
    return 0;
}
```

Output:



Optimal: The theoretically optimal page replacement algorithm (also known as OPT, clairvoyant replacement algorithm, or Bélády's optimal page replacement policy) is an algorithm that works as follows: when a page needs to be swapped in, the operating system swaps out the page whose next use will occur farthest in the future.

Code:

```
#include<stdio.h>
int main()
{
    int f, n, frames[10], p[30], temp[10], flag1, flag2, flag3, i, j, k, pos, max, count = 0;
    printf("ENTER THE NUMBER OF PAGES: ");
```

```
scanf("%d", &n);
printf("ENTER THE NUMBER OF FRAMES: ");
scanf("%d", &f);
printf("ENTER PAGE REFERENCE STRING: ");
for(i = 0; i < n; ++i)
{
   scanf("%d", &p[i]);
}
for(i = 0; i < f; ++i)
{
   frames[i] = -1;
}
for(i = 0; i < n; ++i)
{
   flag1 = flag2 = 0;
   for(j = 0; j < f; ++j)
   {
      if(frames[j] == p[i])
      {
         flag1 = flag2 = 1;
         break;
      }
   }
   if(flag1 == 0)
   {
      for(j = 0; j < f; ++j)
      {
         if(frames[j] == -1)
         {
            count++;
            frames[j] = p[i];
            flag2 = 1;
            break;
         }
      }
   }
   if(flag2 == 0)
   {
      flag3 =0;
```

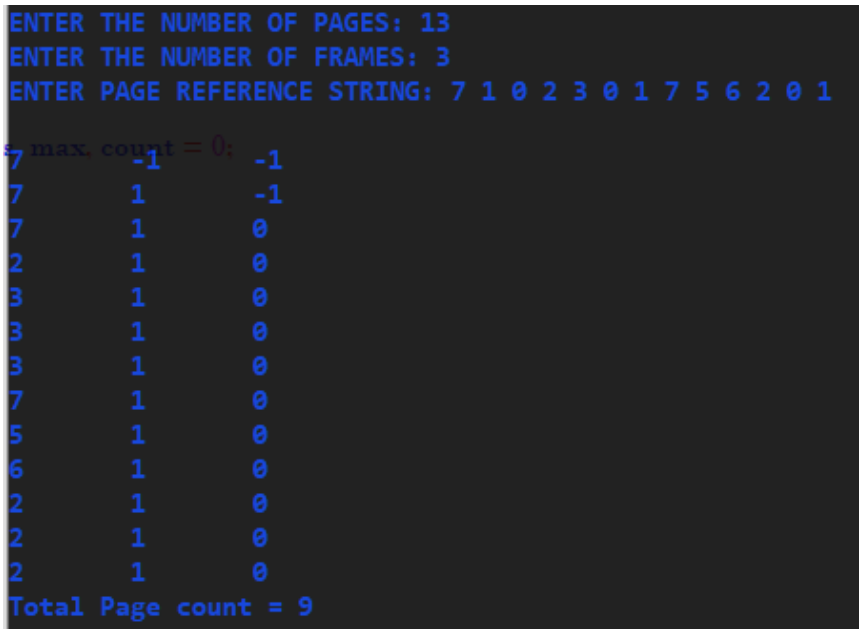
```
    for(j = 0; j < f; ++j)
    {
       temp[j] = -1;
       for(k = i + 1; k < n; ++k)
       {
          if(frames[j] == p[k])
          {
             temp[j] = k;
             break;
          }
       }
    }
    for(j = 0; j < f; ++j)
    {
       if(temp[j] == -1)
       {
          pos = j;
          flag3 = 1;
          break;
       }
    }
    if(flag3 ==0)
    {
       max = temp[0];
       pos = 0;

       for(j = 1; j < f; ++j)
       {
          if(temp[j] > max)
          {
             max = temp[j];
             pos = j;
          }
       }
    }
    frames[pos] = p[i];
    count++;
}
```

```
        printf("\n");

        for(j = 0; j < f; ++j)
        {
            printf("%d\t", frames[j]);
        }
    }
    printf("\nTotal Page count = %d", count);
    return 0;
}
```

Output:



LRU:-

Least Recently Used (LRU) algorithm is a page replacement technique used for memory management. According to this method, the page which is least recently used is replaced. Therefore, in memory, any page that has been unused for a longer period of time than the others is replaced.

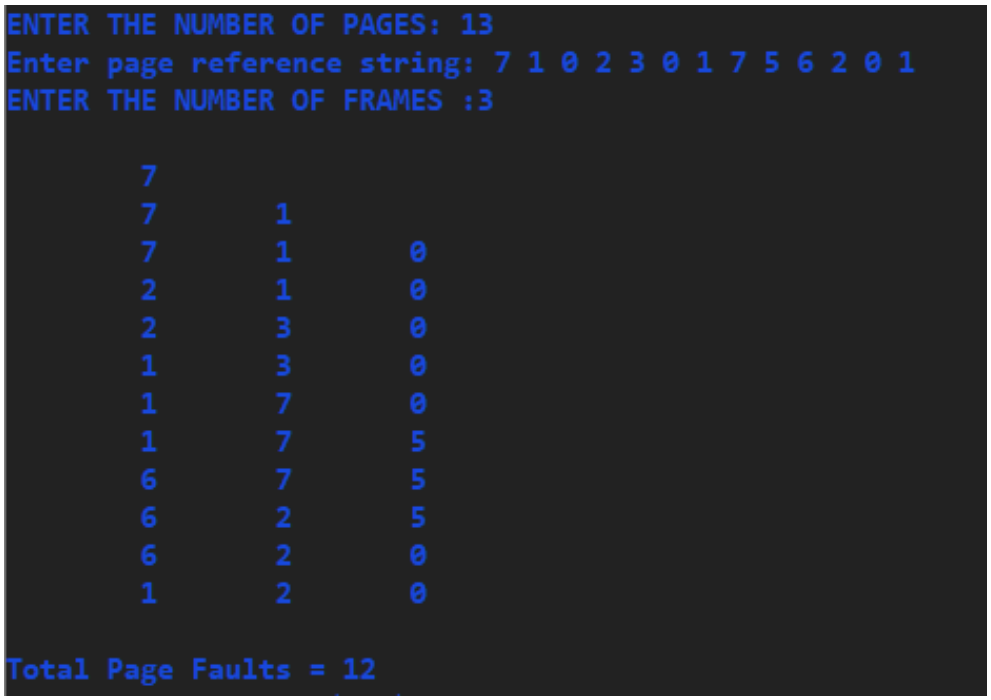
Code:

```
#include<stdio.h>
int main()
{
   int q[20],p[50],c=0,c1,d,f,i,j,k=0,n,r,t,b[20],c2[20];
   printf("ENTER THE NUMBER OF PAGES: ");
   scanf("%d",&n);
   printf("Enter page reference string: ");
   for(i=0; i<n; i++)
      scanf("%d",&p[i]);
   printf("ENTER THE NUMBER OF FRAMES :");
   scanf("%d",&f);
   q[k]=p[k];
   printf("\n\t%d\n",q[k]);
   c++;
   k++;
   for(i=1; i<n; i++)
   {
      c1=0;
      for(j=0; j<f; j++)
      {
         if(p[i]!=q[j])
            c1++;
      }
      if(c1==f)
      {
         c++;
         if(k<f)
         {
            q[k]=p[i];
            k++;
            for(j=0; j<k; j++)
               printf("\t%d",q[j]);
            printf("\n");
         }
         else
         {
            for(r=0; r<f; r++)
            {
```

```
                c2[r]=0;
                for(j=i-1; j<n; j--)
                {
                    if(q[r]!=p[j])
                        c2[r]++;
                    else
                        break;
                }
            }
            for(r=0; r<f; r++)
                b[r]=c2[r];
            for(r=0; r<f; r++)
            {
                for(j=r; j<f; j++)
                {
                    if(b[r]<b[j])
                    {
                        t=b[r];
                        b[r]=b[j];
                        b[j]=t;
                    }
                }
            }
            for(r=0; r<f; r++)
            {
                if(c2[r]==b[0])
                    q[r]=p[i];
                printf("\t%d",q[r]);
            }
            printf("\n");
        }
    }
  }
  printf("\nTotal Page Faults = %d",c);
}
```

s

Output:


ENTER THE NUMBER OF PAGES: 13
Enter page reference string: 7 1 0 2 3 0 1 7 5 6 2 0 1
ENTER THE NUMBER OF FRAMES :3
7
7 1
7 1 0
2 1 0
2 3 0
1 3 0
1 7 0
1 7 5
6 7 5
6 2 5
6 2 0
1 2 0
Total Page Faults = 12