Experiment 7

Subject: CSL403 Operating System Lab

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CLASS: SE COMPS B

BATCH: B

Aim: Study Paging

Objectives: Implement various memory management techniques and evaluate their performances.

Problem Statement:
Implement various page replacement policies

(a)First In First Out

(b)Least Recently Used

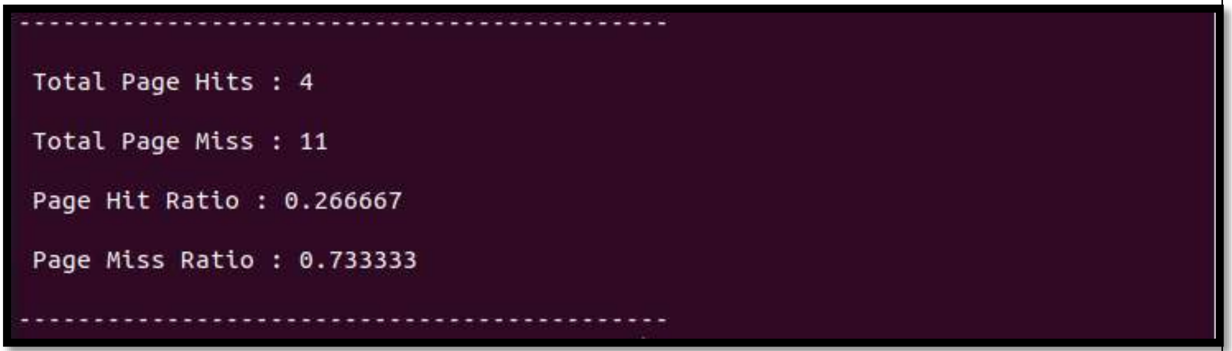
1. Find the number of Page hits, Page Miss, Page hit ratio, Page Miss ratio.

2. Compare the results of both algorithms for a page reference string.

Answer:

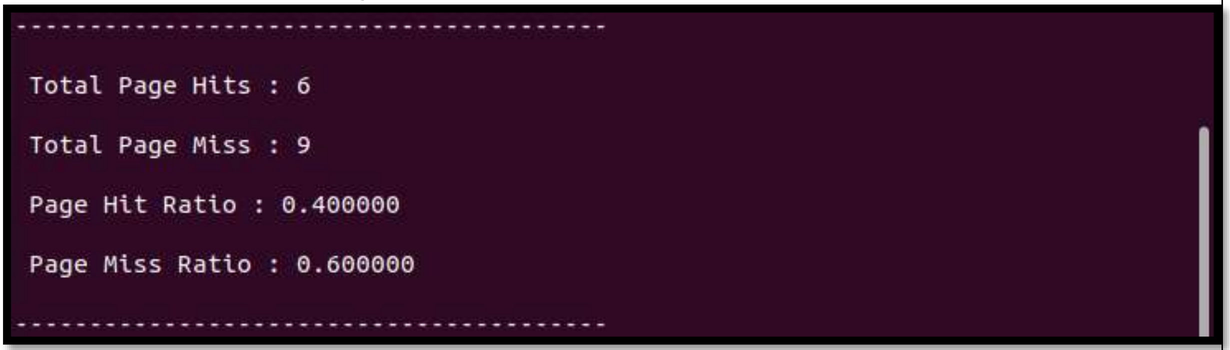
1. **Find the number of Page hits, Page Miss, Page hit ratio, Page Miss Ratio.**

A.] First In First Out



```
--------------------------------------------

 Total Page Hits : 4

 Total Page Miss : 11

 Page Hit Ratio : 0.266667

 Page Miss Ratio : 0.733333

--------------------------------------------
```

B.] Least Recently Used



```
----------------------------------------

 Total Page Hits : 6

 Total Page Miss : 9

 Page Hit Ratio : 0.400000

 Page Miss Ratio : 0.600000

----------------------------------------
```

2. **Compare the results of both algorithms for a page reference string.**

Ans : In case of FIFO :

Page Hits = 4
Page Miss = 11

In case of FIFO :

Page Hits = 6
Page Miss = 9

From the above results we can conclude that LRU performs better than FIFO, since the number of page faults in LRU(9) is less than FIFO(11).

Program Section:

A.] First In First Out

CODE:

```
#include<stdio.h>

int main()
{
    int reference_string[30], page_faults = 0, m, n, s, pages, frames,page_hits;
    printf("\n************FIRST IN FIRST OUT************\n");
    printf("\n Enter Total Number of Pages : ");
    scanf("%d", &pages);

    printf("\n Enter the Values of the Reference String : \n");
    for(m = 0; m < pages; m++)
    {
        printf(" Value No. [%d] : ", m + 1);
        scanf("%d", &reference_string[m]);
    }

    printf("\n Enter Total Number of Frames : ");
    {
        scanf("%d", &frames);
    }
    int temp[frames];
    for(m = 0; m < frames; m++)
    {
        temp[m] = -1;
    }
    for(m = 0; m < pages; m++)
    {
        s = 0;
        for(n = 0; n < frames; n++)
        {
            if(reference_string[m] == temp[n])
            {
                s++;
                page_faults--;
            }
        }
        page_faults++;
        if((page_faults <= frames) && (s == 0))
        {
            temp[m] = reference_string[m];
        }
        else if(s == 0)
        {
            temp[(page_faults - 1) % frames] = reference_string[m];
        }
        printf("\n");
        for(n = 0; n < frames; n++)
```

```
          {
               printf("%d\t", temp[n]);
          }
     }
     page_hits =  pages - page_faults;
     printf("\n-------------------------------------------\n");
     printf("\n Total Page Hits : %d\n", page_hits);
     printf("\n Total Page Miss : %d\n", page_faults);

     printf("\n Page Hit Ratio : %f\n", (double)page_hits/pages);
     printf("\n Page Miss Ratio : %f\n",(double) page_faults/pages);

     printf("\n-------------------------------------------\n");

     return 0;
}
```

B.] Least Recently Used

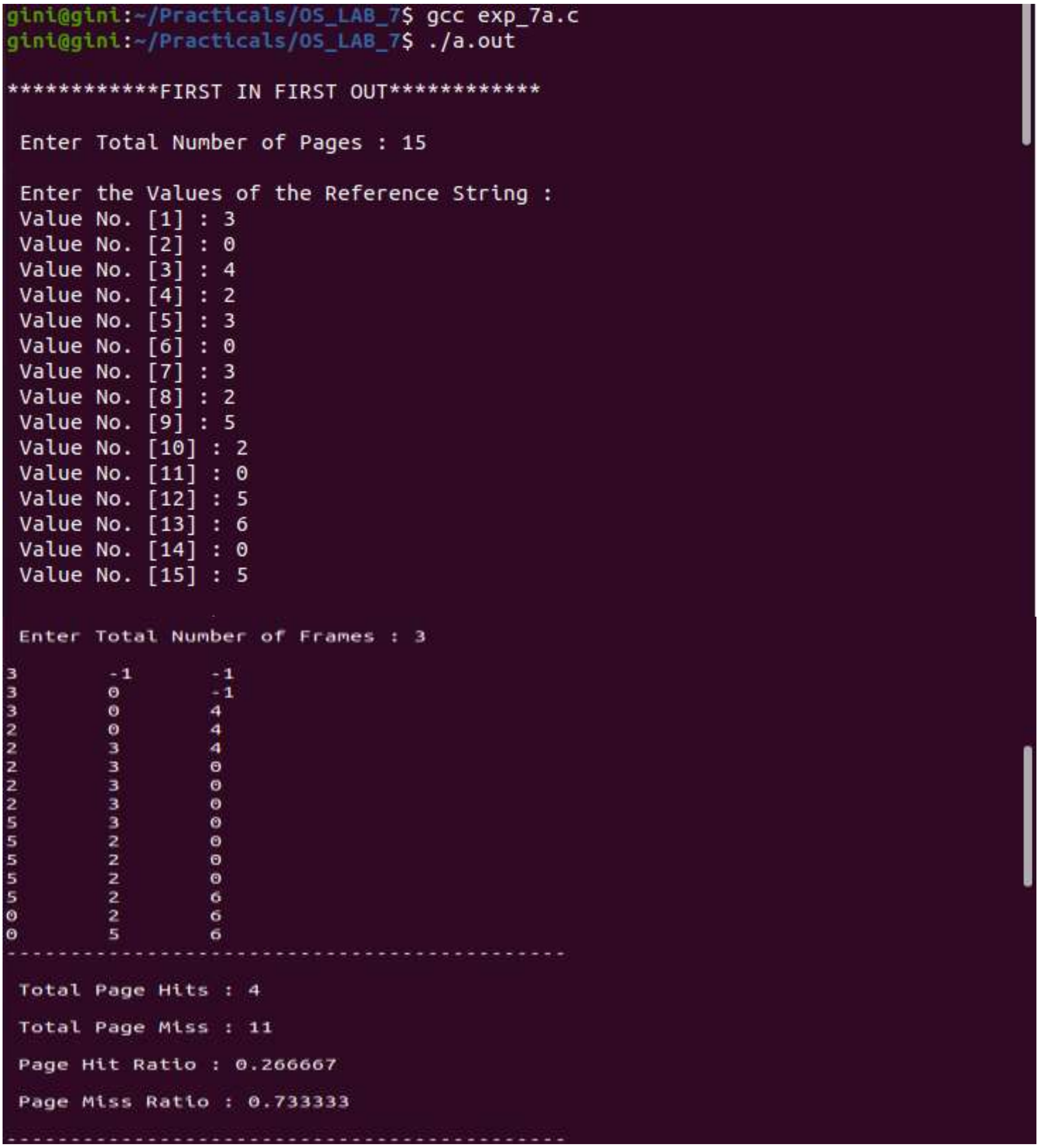
CODE:

```
#include<stdio.h>

int findLRU(int time[], int n){
        int i, minimum = time[0], pos = 0;

        for(i = 1; i < n; ++i){
                if(time[i] < minimum){
                        minimum = time[i];
                        pos = i;
                }
        }

        return pos;
}

int main()
{
   int no_of_frames, no_of_pages, page_hits,frames[10], pages[30], counter = 0, time[10], flag1,
flag2, i, j, pos, faults = 0;
        printf("\n************LEAST RECENTLT USED************\n");

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

   printf("\n Enter the Values of the Reference String : \n");

   for(i = 0; i < no_of_pages; ++i)
   {
        printf(" Value No. [%d] : ", i+ 1);
        scanf("%d", &pages[i]);
   }
   printf("\n Enter the number of frames : ");
         scanf("%d", &no_of_frames);

         for(i = 0; i < no_of_frames; ++i){
         frames[i] = -1;
   }

   for(i = 0; i < no_of_pages; ++i){
         flag1 = flag2 = 0;

         for(j = 0; j < no_of_frames; ++j){
                  if(frames[j] == pages[i]){
                           counter++;
                           time[j] = counter;
                                    flag1 = flag2 = 1;
                                    break;
                           }
         }

         if(flag1 == 0){
                           for(j = 0; j < no_of_frames; ++j){
                           if(frames[j] == -1){
                                    counter++;
                                    faults++;
                                    frames[j] = pages[i];
                                    time[j] = counter;
                                    flag2 = 1;
                                    break;
                           }
                  }
         }

         if(flag2 == 0){
                  pos = findLRU(time, no_of_frames);
                  counter++;
                  faults++;
                  frames[pos] = pages[i];
                  time[pos] = counter;
         }

         printf("\n");

         for(j = 0; j < no_of_frames; ++j){
                  printf(" %d\t", frames[j]);
         }
         }

    page_hits =  no_of_pages - faults;
    printf("\n---------------------------------------\n");
    printf("\n Total Page Hits : %d\n", page_hits);
    printf("\n Total Page Miss : %d\n", faults);

    printf("\n Page Hit Ratio : %f\n", (double)page_hits/no_of_pages);
    printf("\n Page Miss Ratio : %f\n",(double)faults/no_of_pages);
    printf("\n----------------------------------------\n");


  return 0;
}
```

Output Section:

A.] First In First Out

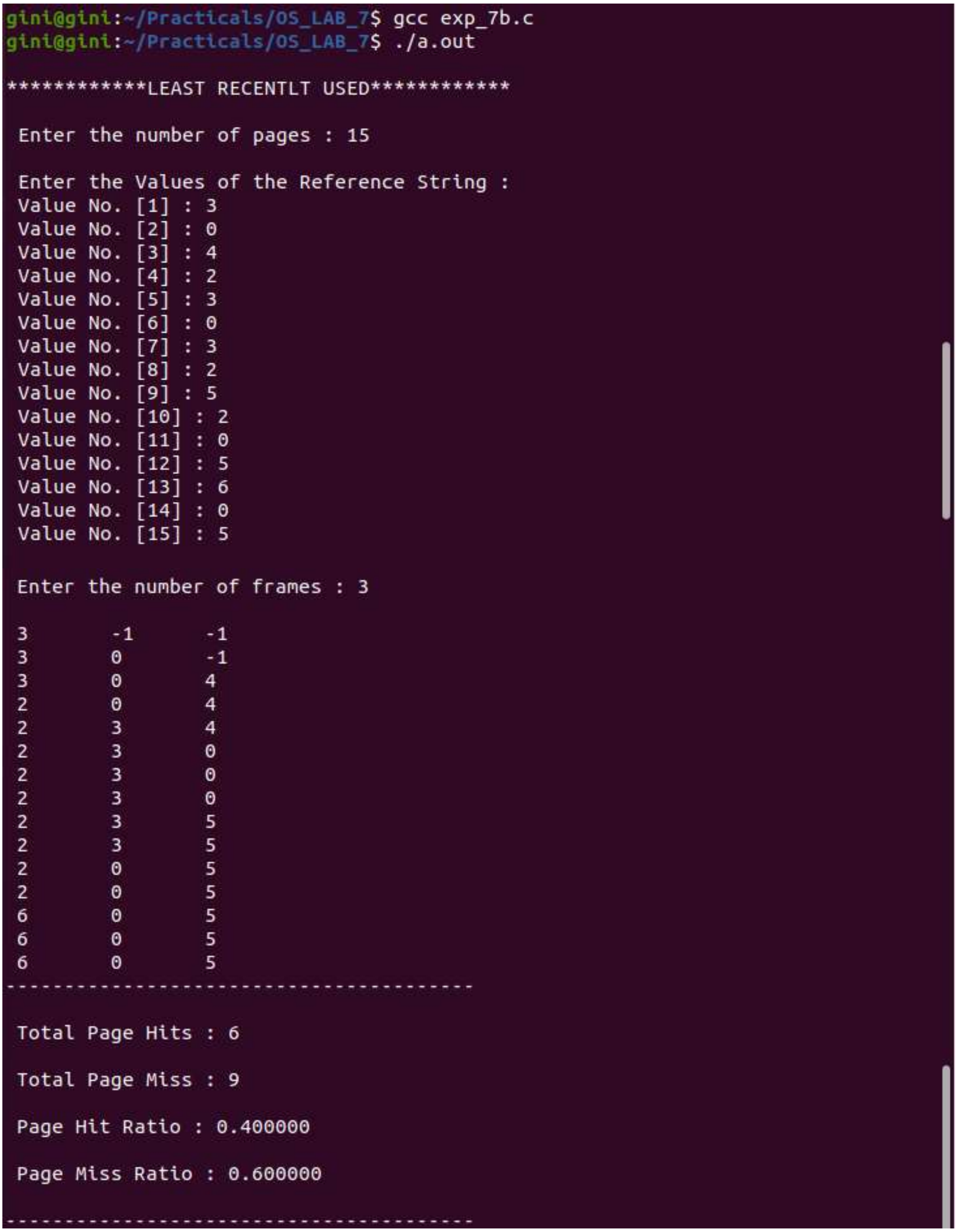
OUTPUT:



```
gini@gini:~/Practicals/OS_LAB_7$ gcc exp_7a.c
gini@gini:~/Practicals/OS_LAB_7$ ./a.out

************FIRST IN FIRST OUT************

 Enter Total Number of Pages : 15

 Enter the Values of the Reference String :
 Value No. [1] : 3
 Value No. [2] : 0
 Value No. [3] : 4
 Value No. [4] : 2
 Value No. [5] : 3
 Value No. [6] : 0
 Value No. [7] : 3
 Value No. [8] : 2
 Value No. [9] : 5
 Value No. [10] : 2
 Value No. [11] : 0
 Value No. [12] : 5
 Value No. [13] : 6
 Value No. [14] : 0
 Value No. [15] : 5


 Enter Total Number of Frames : 3

3       -1      -1
3       0       -1
3       0       4
2       0       4
2       3       4
2       3       0
2       3       0
2       3       0
5       3       0
5       2       0
5       2       0
5       2       0
5       2       6
0       2       6
0       5       6
----------------------------------------

 Total Page Hits : 4

 Total Page Miss : 11

 Page Hit Ratio : 0.266667

 Page Miss Ratio : 0.733333

----------------------------------------
```

B.] Least Recently Used

OUTPUT:



```
gini@gini:~/Practicals/OS_LAB_7$ gcc exp_7b.c
gini@gini:~/Practicals/OS_LAB_7$ ./a.out

************LEAST RECENTLT USED************

 Enter the number of pages : 15

 Enter the Values of the Reference String :
 Value No. [1] : 3
 Value No. [2] : 0
 Value No. [3] : 4
 Value No. [4] : 2
 Value No. [5] : 3
 Value No. [6] : 0
 Value No. [7] : 3
 Value No. [8] : 2
 Value No. [9] : 5
 Value No. [10] : 2
 Value No. [11] : 0
 Value No. [12] : 5
 Value No. [13] : 6
 Value No. [14] : 0
 Value No. [15] : 5

 Enter the number of frames : 3

 3       -1      -1
 3       0       -1
 3       0       4
 2       0       4
 2       3       4
 2       3       0
 2       3       0
 2       3       0
 2       3       5
 2       3       5
 2       0       5
 2       0       5
 6       0       5
 6       0       5
 6       0       5
----------------------------------------

 Total Page Hits : 6

 Total Page Miss : 9

 Page Hit Ratio : 0.400000

 Page Miss Ratio : 0.600000

----------------------------------------
```