WEEK 9

Write a C program to simulate page replacement algorithms
a) FIFO
b) LRU
c) Optimal

a) FIFO

CODE:

```
#include <stdio.h>
#include <conio.h>
int fr[3];
void display() {
   int i;
   printf("\n");
   for (i = 0; i < 3; i++)
      printf("%d\t", fr[i]);
}

int main() {
   void display();
   int i, j, page[12], n;
   int flag1 = 0, flag2 = 0, pf = 0, frsize = 3, top = 0;
   printf("First in First out:\n");
   printf("Enter the number of pages in the reference string: ");
   scanf("%d", &n);

   printf("Enter the reference string (space-separated page numbers): ");
   for (i = 0; i < n; i++) {
      scanf("%d", &page[i]);
   }

   for (i = 0; i < 3; i++) {
      fr[i] = -1;
   }
```

```
    for (j = 0; j < n; j++) {
        flag1 = 0;
        flag2 = 0;
        for (i = 0; i < 3; i++) {
            if (fr[i] == page[j]) {
                flag1 = 1;
                flag2 = 1;
                break;
            }
        }

        if (flag1 == 0) {
            for (i = 0; i < frsize; i++) {
                if (fr[i] == -1) {
                    fr[i] = page[j];
                    flag2 = 1;
                    break;
                }
            }
        }

        if (flag2 == 0) {
            fr[top] = page[j];
            top = (top + 1) % frsize;
            pf++;
        }
        display();
    }
    printf("\n");
    printf("Number of page faults : %d ", pf + frsize);
    getch();
    return 0;
}
```

OUTPUT:

```
First in First out:
Enter the number of pages in the reference string: 12
Enter the reference string (space-separated page numbers): 2 3 2 1 5 2 4 5 3 2 5 2

2       -1      -1
2       3       -1
2       3       -1
2       3       1
5       3       1
5       2       1
5       2       4
5       2       4
3       2       4
3       2       4
3       5       4
3       5       2
Number of page faults : 9
```

b) LRU

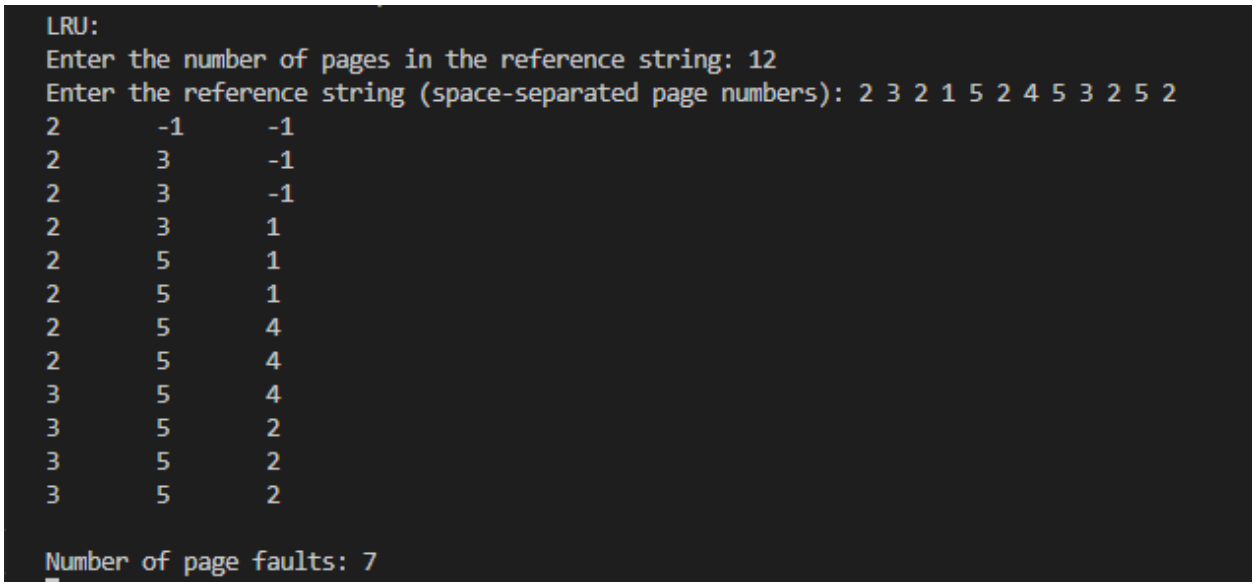
CODE:

```
#include <stdio.h>
#include <conio.h>
void display(int fr[], int frsize) {
    for (int i = 0; i < frsize; i++) {
        if (fr[i] == -1) {
            printf("-1\t");
        } else {
            printf("%d\t", fr[i]);
        }
        if ((i + 1) % 3 == 0) {
            printf("\n");
        }
    }
}

int main() {
    int fr[3];
    int page[12], n;
    int fs[3];
```

```
int index, k, l, flag1, flag2, pf, frsize = 3;
printf("LRU:\n");
printf("Enter the number of pages in the reference string: ");
scanf("%d", &n);

printf("Enter the reference string (space-separated page numbers): ");
for (int i = 0; i < n; i++) {
   scanf("%d", &page[i]);
}
for (int i = 0; i < 3; i++) {
   fr[i] = -1;
}
flag1 = 0;
flag2 = 0;
pf = 0;
for (int j = 0; j < n; j++) {
   flag1 = 0;
   flag2 = 0;
   for (int i = 0; i < 3; i++) {
      if (fr[i] == page[j]) {
         flag1 = 1;
         flag2 = 1;
         break;
      }
   }

   if (flag1 == 0) {
      for (int i = 0; i < frsize; i++) {
         if (fr[i] == -1) {
            fr[i] = page[j];
            flag2 = 1;
            break;
         }
      }
   }
```

```
        if (flag2 == 0) {
            for (int i = 0; i < 3; i++) {
                fs[i] = 0;
            }
            for (int k = j - 1, l = 1; l <= frsize - 1; l++, k--) {
                for (int i = 0; i < 3; i++) {
                    if (fr[i] == page[k]) {
                        fs[i] = 1;
                    }
                }
            }

            index = -1;
            for (int i = 0; i < 3; i++) {
                if (fs[i] == 0) {
                    index = i;
                    break;
                }
            }
            if (index == -1) {
                index = 0;
            }
            fr[index] = page[j];
            Pf++;
          }

        display(fr, frsize);
    }

    printf("\nNumber of page faults: %d\n", pf + frsize);
    getch();

    return 0;
}
```

OUTPUT:



c) Optimal

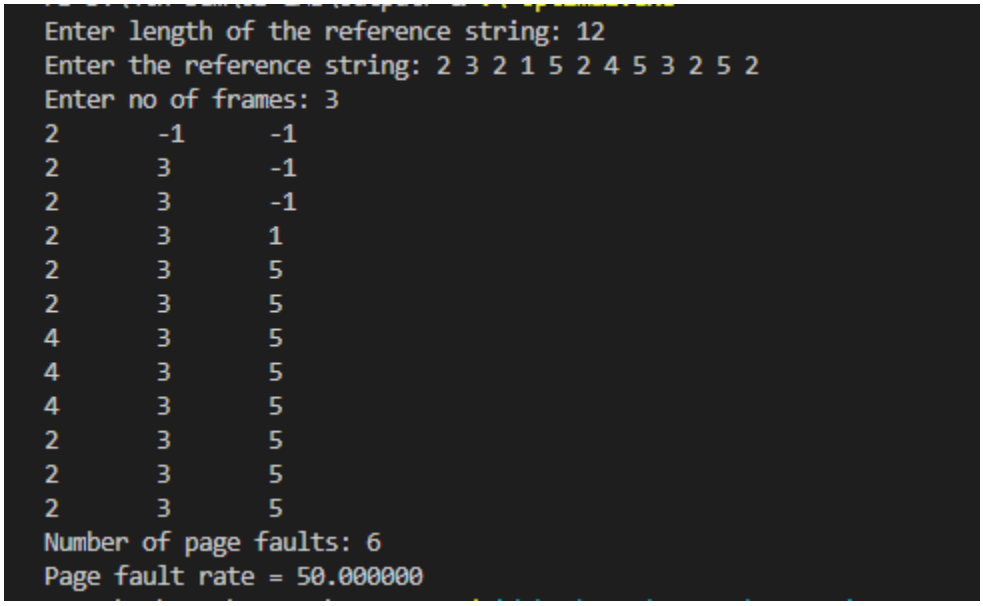
CODE:

```
#include <stdio.h>
#include <conio.h>
int fr[3], n, m;
void display();
void main() {
    int i, j, page[20], fs[10];
    int max, found = 0, lg[3], index, k, l, flag1 = 0, flag2 = 0, pf = 0;
    float pr;
    printf("Enter length of the reference string: ");
    scanf("%d", &n);
    printf("Enter the reference string: ");
    for (i = 0; i < n; i++)
        scanf("%d", &page[i]);
    printf("Enter no of frames: ");
    scanf("%d", &m);
```

```
for (i = 0; i < m; i++)
    fr[i] = -1;
pf = m;
for (j = 0; j < n; j++) {
    flag1 = 0;
    flag2 = 0;
    for (i = 0; i < m; i++) {
        if (fr[i] == page[j]) {
            flag1 = 1;
            flag2 = 1;
            break;
        }
    }
    if (flag1 == 0) {
        for (i = 0; i < m; i++) {
            if (fr[i] == -1) {
                fr[i] = page[j];
                flag2 = 1;
                break;
            }
        }
    }
    if (flag2 == 0) {
        for (i = 0; i < m; i++)
            lg[i] = 0;
        for (i = 0; i < m; i++) {
            for (k = j + 1; k < n; k++) {
                if (fr[i] == page[k]) {
                    lg[i] = k - j;
                    break;
                }
            }
        }

        found = 0;
```

```
            for (i = 0; i < m; i++) {
                if (lg[i] == 0) {
                    index = i;
                    found = 1;
                    break;
                }
            }

            if (found == 0) {
                max = lg[0];
                index = 0;
                for (i = 0; i < m; i++) {
                    if (max < lg[i]) {
                        max = lg[i];
                        index = i;
                    }
                }
            }

            fr[index] = page[j];
            pf++;
        }
        display();
    }
    printf("Number of page faults: %d\n", pf);
    pr = (float)pf / n * 100;
    printf("Page fault rate = %f \n", pr);
}
void display() {
    int i;

    for (i = 0; i < m; i++)
        printf("%d\t", fr[i]);

    printf("\n");
```

}
OUTPUT:


Enter length of the reference string: 12
Enter the reference string: 2 3 2 1 5 2 4 5 3 2 5 2
Enter no of frames: 3
2 -1 -1
2 3 -1
2 3 -1
2 3 1
2 3 5
2 3 5
4 3 5
4 3 5
4 3 5
2 3 5
2 3 5
2 3 5
Number of page faults: 6
Page fault rate = 50.000000