**Bharatiya Vidya Bhavan's**
# Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

## Information Technology Department

**Academic Year:** 2021-2022

**Class:** S.Y.B.Tech **Sem.:** IV **Course:** IT206 Operating Systems

**Name:** Amal Thundiyil

**UID:** 2020400066

**Class:** IT (Batch-D)

**Experiment No.:** 7

**Title:** Semaphores

**Aim:** The program r.c initializes n number of semaphores. It first assigns count equal -1, which is then used by process p and q. This count is protected by semaphore. It also allocates shared memory of size 40 ints. It waits for process p and q to enter all n1 and n2 elements through different terminals. This program r.c sorts shared data in ascending order. It waits to finish p and q. At end, The program r.c detaches and deletes n semaphores and prints the sum of all elements of the list.

**Code:**

r.c

```
#include <error.h>
#include <fcntl.h>
#include <semaphore.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/shm.h>
#include <sys/wait.h>
#include <unistd.h>
#define SHMSZ 27

void bubble_sort(int arr[], int n) {
   int i, j;
```

```
    for (i = 0; i < n - 1; i++) {
        for (j = 0; j < n - i - 1; j++) {
            if (arr[j] > arr[j + 1]) {
                int temp = arr[j];
                arr[j] = arr[j + 1];
                arr[j + 1] = temp;
            }
        }
    }
}
int main() {
    key_t key = 1234;
    sem_unlink("r");
    sem_t *r = sem_open("r", O_CREAT | O_EXCL, 0660, 0);
    if (r == SEM_FAILED) {
        perror("ERROR !! \n");
        exit(EXIT_FAILURE);
    }
    int sh_id = shmget(key, 40 * sizeof(int), IPC_CREAT | 0777);
    int *sh = (int *)shmat(sh_id, NULL, 0);
    sem_wait(r);
    sem_post(r);
    sleep(2);
    sem_wait(r);
    int c = 0;
    while (1) {
```

```
        if (sh[c] == -1) {
            break;
        } else
            c++;
    }
    bubble_sort(sh, c);
    printf("Final sorted array: ");
    for (int i = 0; i < c; i++)
        printf("%d ", sh[i]);
    printf("\n");
    int ans = 0;
    for (int i = 0; i < 40; i++) {
        ans += sh[i];
    }
    printf("Sum of the array is: %d", ans);
    sem_close(r);
}
```

p.c

```
#include <pthread.h>
#include <semaphore.h>
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>
#include <sys/ipc.h>
#include <sys/shm.h>
```

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```
#include <time.h>

int main() {
    int n;
    printf("Enter no. of elems: \n");
    scanf("%d", &n);
    printf("\n");
    key_t key = 1234;
    int sh_id = shmget(key, 40 * sizeof(int), IPC_CREAT | 0777);
    int *sh = (int *)shmat(sh_id, NULL, 0);
    sem_t *p = sem_open("r", 0);
    for (int i = 0; i < n; i++)
        scanf("%d", &sh[i]);
    sh[n] = -1;
    sem_post(p);
}
```

q.c

```
#include <pthread.h>
#include <semaphore.h>
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <time.h>
```

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```
int main() {
    key_t key = 1234;
    int segment_id = shmget(key, 40 * sizeof(int), IPC_CREAT | 0777);
    int *sh = (int *)shmat(segment_id, NULL, 0);
    sem_t *p = sem_open("r", 0);
    sem_wait(p);
    int n, k = 0;
    printf("Enter no. of elems: \n");
    scanf("%d", &n);
    printf("\n");
    while (1) {
        if (sh[k] == -1) {
            break;
        } else
            k++;
    }
    for (int i = 0; i < n; i++)
        scanf("%d", &sh[k + i]);
    sh[k + n] = -1;
    sem_post(p);
}
```

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**Output:**