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CSCI 375
Project #2

Important Notes :

w1= writer 1
w2= writer 2

r1= reader 1
r2= reader 2
r3= reader 3

Optional read and write print
switch (r1counter) contains “r1 has arrived within the critical section”
Switch (r2counter) contains “r2 has arrived within the critical section”
Switch (r3counter) contains “r3 has arrived within the critical section”
Switch (w1counter) contains “w1 has arrived within the critical section”
Switch (w2 counter) contains “w2 has arrived within the critical section”

“Panic Message”: Error will read as “AN ERROR HAS OCCURED”

Subproject Part 1

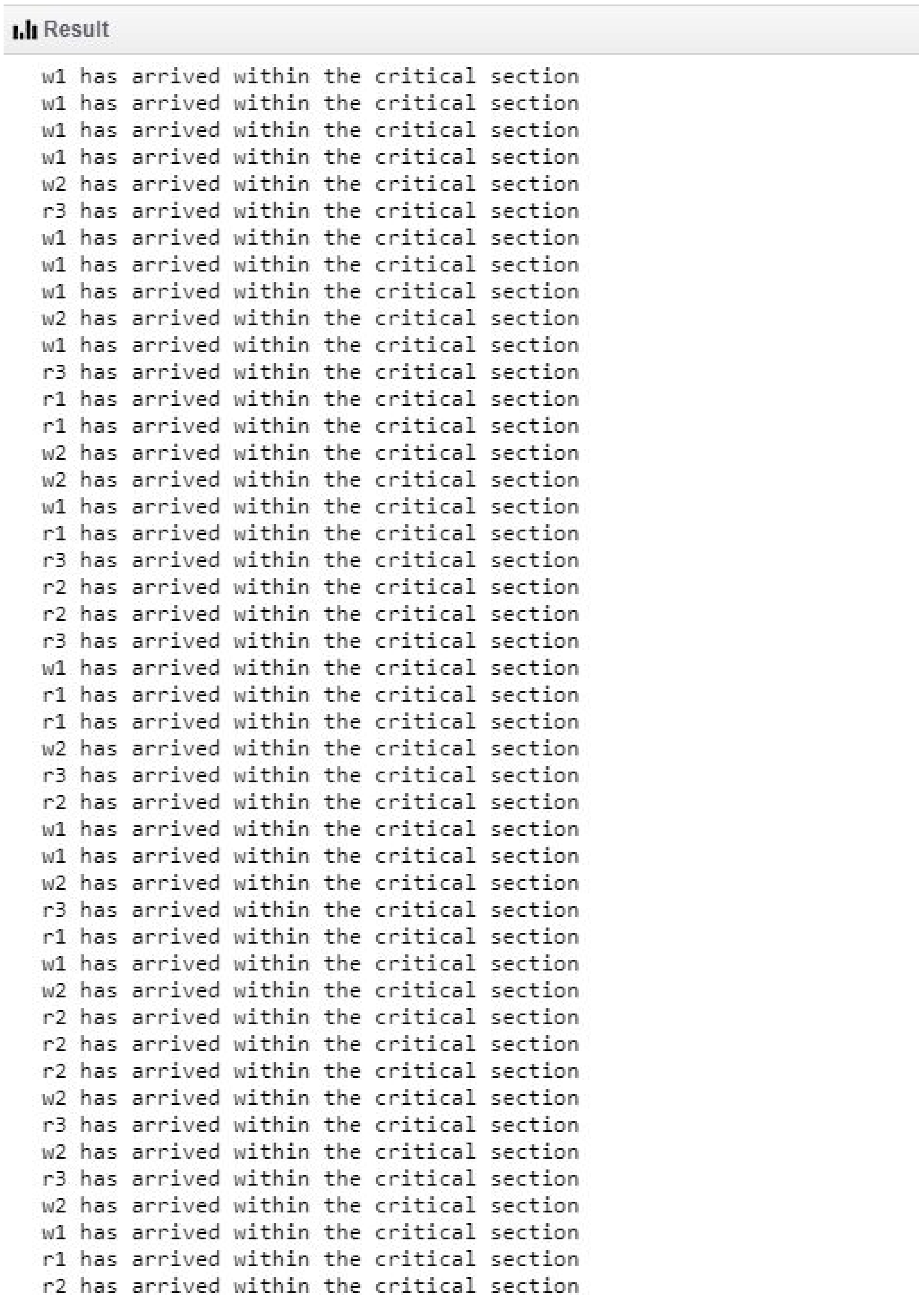
```
#include <iostream>
using namespace std;
        int line_counter =0;
        int r1counter= 0, r2counter = 0, r3counter=0, w1counter = 0, w2counter=0;
        int S1= 2, i, S2 = 1;

        void P1()
        {
                if (S1 <= 0 || S2 != 1);
                else
                        S1--;

        }
void V1()
{
        S1++;
}
void P2()
{
        if (S2 <=0 || S1 != 3);
                else
                        S2--;
}
```

```
void V2()
{
        S2++;
}


void r1()

{
switch (r1counter)
{
case 0: r1counter++; break;
case 1: r1counter++; break;
case 2: r1counter++; break;
case 3: r1counter++; break;
case 4: r1counter++; break;
case 5: P1(); r1counter++; cout<< " r1 has arrived within the critical section " << endl; break;
case 6: i = 0; r1counter++; cout<< " r1 has arrived within the critical section " << endl; break;
case 7: if ( i < 10 ) r1counter++; else r1counter=9; cout<< " r1 has arrived within the critical
section " << endl; break;
case 8: i++; r1counter--; cout<< " r1 has arrived within the critical section " << endl; break;
case 9: V1(); r1counter++; cout<< " r1 has arrived within the critical section " << endl; break;
case 10: r1counter = 0; break;
}
}

void r2()
{
switch (r2counter)
{
case 0: r2counter++; break;
case 1: r2counter++; break;
case 2: r2counter++; break;
case 3: r2counter++; break;
case 4: r2counter++; break;
case 5: P1(); r2counter++; cout<< " r2 has arrived within the critical section " << endl; break;
case 6: i = 0; r2counter++;cout<< " r2 has arrived within the critical section " << endl; break;
case 7: if ( i < 10 ) r2counter++; else r2counter=9;cout<< " r2 has arrived within the critical
section " << endl;break;
case 8: i++; r2counter--;cout<< " r2 has arrived within the critical section " << endl; break;
case 9: V1(); r2counter++;cout<< " r2 has arrived within the critical section " << endl; break;
case 10: r2counter = 0; break;
}
```

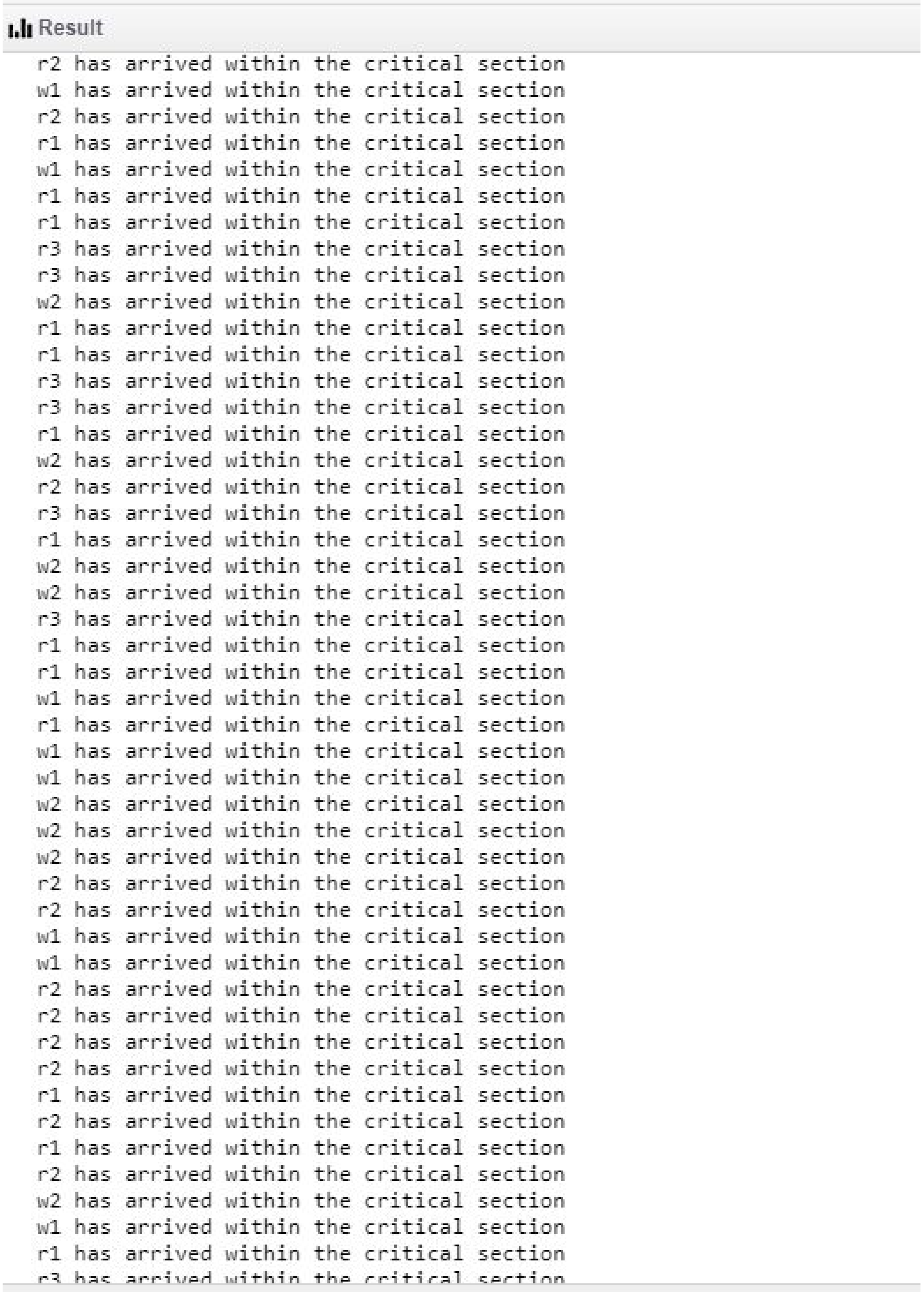
```
}

void r3()
{
switch (r3counter)
{
case 0: r3counter++; break;
case 1: r3counter++; break;
case 2: r3counter++; break;
case 3: r3counter++; break;
case 4: r3counter++; break;
case 5: P1(); r3counter++; cout<< " r3 has arrived within the critical section " << endl; break;
case 6: i = 0; r3counter++;cout<< " r3 has arrived within the critical section " << endl; break;
case 7: if ( i < 10 ) r3counter++; else r3counter=9; cout<< " r3 has arrived within the critical
section " << endl; break;
case 8: i++; r3counter--; cout<< " r3 has arrived within the critical section " << endl; break;
case 9: V1(); r3counter++; cout<< " r3 has arrived within the critical section " << endl; break;
case 10: r3counter = 0; break;
}
}
void w1()
{
switch (w1counter)
{
case 0: w1counter++; break;
case 1: w1counter++; break;
case 2: w1counter++; break;
case 3: w1counter++; break;
case 4: w1counter++; break;
case 5: P2(); w1counter++;cout<< " w1 has arrived within the critical section " << endl; break;
case 6: i = 0; w1counter++;cout<< " w1 has arrived within the critical section " << endl; break;
case 7: if ( i < 10 ) w1counter++; else w1counter=9;cout<< " w1 has arrived within the critical
section " << endl; break;
case 8: i++; w1counter--;cout<< " w1 has arrived within the critical section " << endl; break;
case 9: V2(); w1counter++; cout<< " w1 has arrived within the critical section " << endl; break;
case 10: w1counter = 0; break;
}
}
void w2()
{
switch (w2counter)
{
```

```
case 0: w2counter++; break;
case 1: w2counter++; break;
case 2: w2counter++; break;
case 3: w2counter++; break;
case 4: w2counter++; break;
case 5: P2(); w2counter++; cout<< " w2 has arrived within the critical section " << endl; break;
case 6: i = 0; w2counter++; cout<< " w2 has arrived within the critical section " << endl; break;
case 7: if ( i < 10 ) w2counter++; else w2counter=9;cout<< " w2 has arrived within the critical
section " << endl; break;
case 8: i++; w2counter--;cout<< " w2 has arrived within the critical section " << endl; break;
case 9: V2(); w2counter++;cout<< " w2 has arrived within the critical section " << endl; break;
case 10: w2counter = 0; break;
}
}


int main ()

{
        srand(time(0));
        int pick;

        for(int a= 0; a < 300; a++)
        {

        pick = rand() % 5;
        switch (pick)
        {

                case 0: r1(); break;
                case 1: r2(); break;
                case 2: r3(); break;
                case 3: w1(); break;
                case 4: w2(); break;
                default: cout << " AN ERROR HAS OCCURRED " << endl;
                break;

        }
        }
}
```

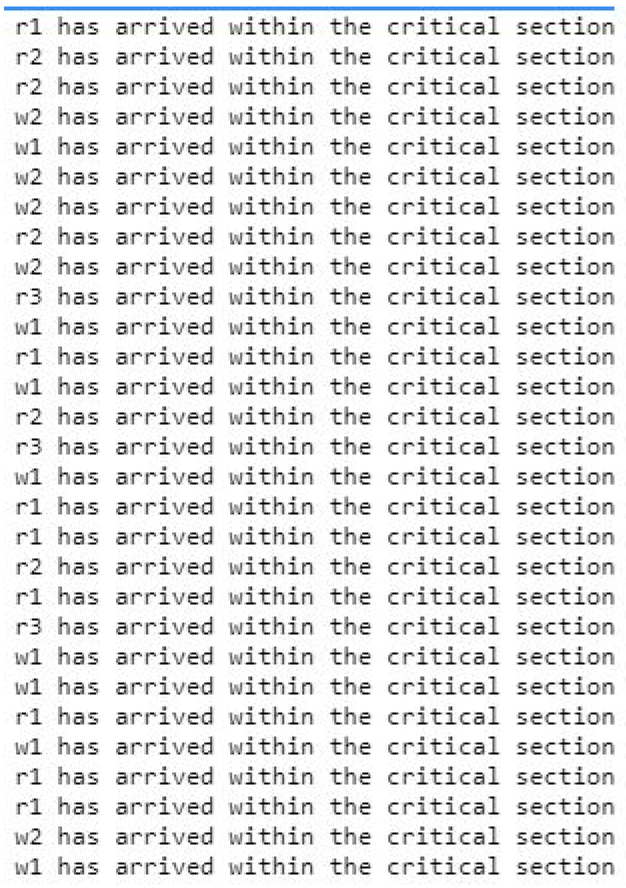
OUTPUT:


Result

```
w1 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
```


Result

```
r2 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
```



```
r1 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
```

Subproject PART 2

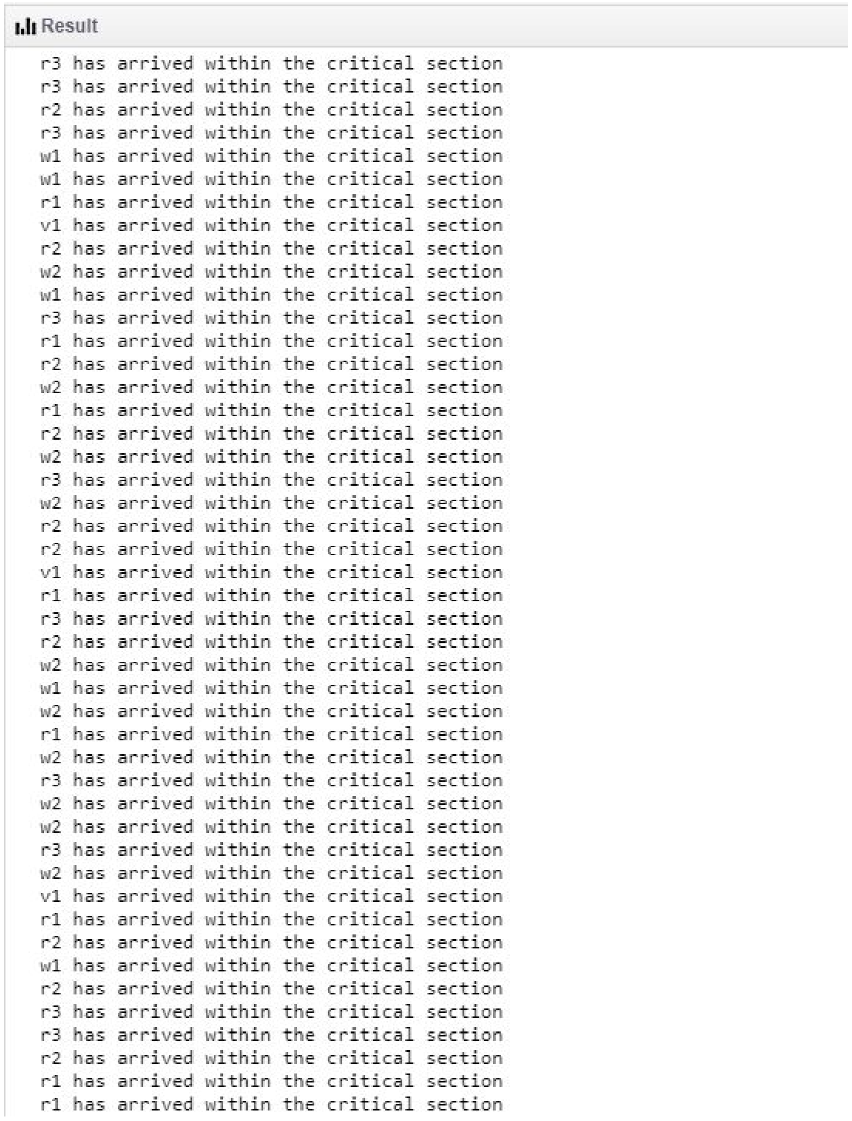
For this part, I had decided to go with the test and set method. With this method, it's creating a mutual exclusion upon the environment. This means that the CPU is instructed by the means of the multiprocessor. The reason for the use of the test and set method, was to avoid anyone sort of resource contention. A resource contention is one where an issue can occur amongst the cache memory or random access memory. This resource contention can occur upon a lock that is busy. This can lead to a fault within the programming. To correct this, test and set helps to lower the overhead. Thus, It helps to increase the chance of a successful protocol.

```
#include <iostream>
using namespace std;


        int line_counter =0;
        int r1counter= 0, r2counter = 0, r3counter=0, w1counter = 0, w2counter=0;
        int S1= 3, i, S2 = 1;
        bool lock = false;  // the shared lock value
        bool testandset(bool * lock)  // the atomic look up
        {
                bool newlock = *lock;
                *lock = true;
                return newlock;
        }

void r1()

{
switch (r1counter)  // Reader 1 function
{
case 0: r1counter++; break;
case 1: r1counter++; break;
case 2: r1counter++; break;
case 3: r1counter++; break;
case 4: r1counter++; break;
case 5: testandset(&lock); r1counter++; cout<< " r1 has arrived within the critical section " <<
endl; break;
case 6: for(int i = 0; i <10; i++); r1counter++; cout<< " r1 has arrived within the critical section "
<< endl; break;
case 7: if ( i < 10 ) r1counter++; else r1counter=9; cout<< " r1 has arrived within the critical
section " << endl; break;
case 8: i++; r1counter--; cout<< " r1 has arrived within the critical section " << endl; break;
case 9: lock = false; r1counter++; cout<< " r1 has arrived within the critical section " << endl;
break;
case 10: r1counter = 0; break;
}
}

void r2()
{
switch (r2counter)  // Reader 2 function

{
case 0: r2counter++; break;
case 1: r2counter++; break;
case 2: r2counter++; break;
case 3: r2counter++; break;
case 4: r2counter++; break;
case 5: testandset(&lock); r2counter++; cout<< " r2 has arrived within the critical section " <<
endl; break;
```

```
case 6: for(int i = 0; i <10; i++); r2counter++;cout<< " r2 has arrived within the critical section "
<< endl; break;
case 7: if ( i < 10 ) r2counter++; else r2counter=9;cout<< " r2 has arrived within the critical
section " << endl;break;
case 8: i++; r2counter--; cout<< " r2 has arrived within the critical section " << endl; break;
case 9: lock = false; r2counter++;cout<< " r2 has arrived within the critical section " << endl;
break;
case 10: r2counter = 0; break;
}

}

void r3()
{
switch (r3counter)
{
case 0: r3counter++; break;
case 1: r3counter++; break;
case 2: r3counter++; break;
case 3: r3counter++; break;
case 4: r3counter++; break;
case 5: testandset(&lock); r3counter++; cout<< " r3 has arrived within the critical section " <<
endl; break;
case 6: for(int i = 0; i <10; i++); r3counter++;cout<< " r3 has arrived within the critical section "
<< endl; break;
case 7: if ( i < 10 ) r3counter++; else r3counter=9; cout<< " r3 has arrived within the critical
section " << endl; break;
case 8: i++; r3counter--; cout<< " r3 has arrived within the critical section " << endl; break;
case 9: lock = false; r3counter++; cout<< " r3 has arrived within the critical section " << endl;
break;
case 10: r3counter = 0; break;
}
}
void w1()
{
switch (w1counter)
{
case 0: w1counter++; break;
case 1: w1counter++; break;
case 2: w1counter++; break;
case 3: w1counter++; break;
case 4: w1counter++; break;
case 5: testandset(&lock); w1counter++;cout<< " w1 has arrived within the critical section " <<
endl; break;
case 6: for(int i = 0; i <10; i++); w1counter++;cout<< " w1 has arrived within the critical section "
<< endl; break;
case 7: if ( i < 10 ) w1counter++; else w1counter=9;cout<< " v1 has arrived within the critical
section " << endl; break;
case 8: i++; w1counter--;cout<< " w1 has arrived within the critical section " << endl; break;
case 9: lock = false; w1counter++; cout<< " w1 has arrived within the critical section " << endl;
break;
case 10: w1counter = 0; break;
}
}
void w2()
{
switch (w2counter)
{
case 0: w2counter++; break;
case 1: w2counter++; break;
case 2: w2counter++; break;
case 3: w2counter++; break;
case 4: w2counter++; break;
case 5: testandset(&lock); w2counter++; cout<< " w2 has arrived within the critical section " <<
endl; break;
case 6: for(int i = 0; i <10; i++); w2counter++; cout<< " w2 has arrived within the critical section "
<< endl; break;
case 7: if ( i < 10 ) w2counter++; else w2counter=9;cout<< " w2 has arrived within the critical
section" << endl; break;
case 8: i++; w2counter--;cout<< " w2 has arrived within the critical section " << endl; break;
case 9: lock = false; w2counter++;cout<< " w2 has arrived within the critical section " << endl;
break;
case 10: w2counter = 0; break;
}
}


int main ()

{
        srand(time(0));
        int pick;

        for(int a= 0; a < 300; a++)
        {
```

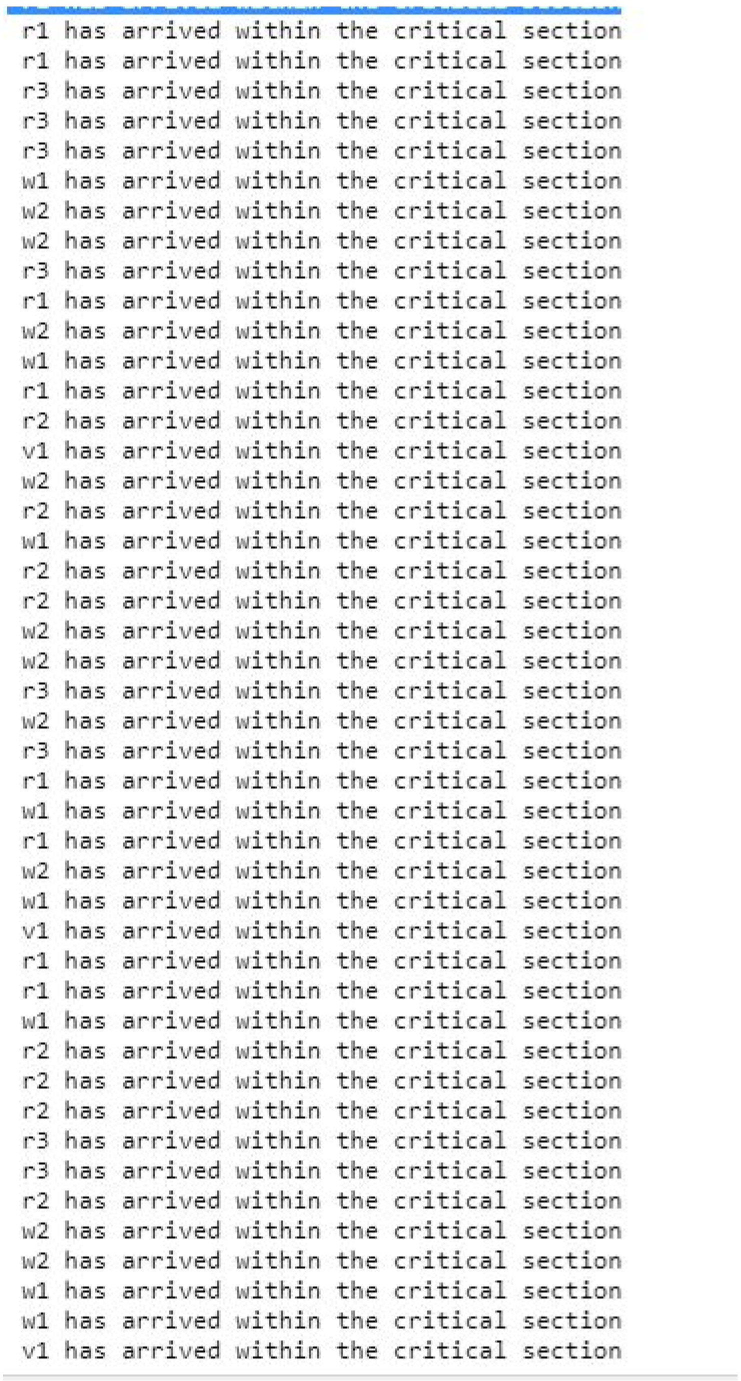
```
        pick = rand() % 5;
        switch (pick)
        {

                case 0: r1(); break;
                case 1: r2(); break;
                case 2: r3(); break;
                case 3: w1(); break;
                case 4: w2(); break;
                default: cout << " AN ERROR HAS OCCURRED " << endl;
                break;

        }
        }
}
```

OUTPUT:



Result

```
r3 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
v1 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
v1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
v1 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
```



```
r1 has arrived within the critical section
r1 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
w1 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
r2 has arrived within the critical section
v1 has arrived within the critical section
w2 has arrived within the critical section
r2 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
w2 has arrived within the critical section
r3 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r1 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
v1 has arrived within the critical section
r1 has arrived within the critical section
r1 has arrived within the critical section
w1 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r2 has arrived within the critical section
r3 has arrived within the critical section
r3 has arrived within the critical section
r2 has arrived within the critical section
w2 has arrived within the critical section
w2 has arrived within the critical section
w1 has arrived within the critical section
w1 has arrived within the critical section
v1 has arrived within the critical section
```