

# I. Rajasekhar Reddy - CS20BTECH11020

## Programming Assignment-4

First of all, include the libraries in the program and then in the main we open the file "inp-params.txt" and take the values of  $n$ ,  $k$ ,  $\lambda_1$ ,  $\lambda_2$ .

We define these variables globally along with these we also define waiting time and max waiting time globally so that they will be useful for analysis.

After taking input we create  $n$  threads and ids of threads and send into the respecting functions "testing Tas", "testing Cas", "testing Cas-bounded".

For getting instant time we write a function "func\_Time" so that this function returns a vector<int> value that contains the hours minutes and seconds.

We make two exponential distributions and pass the value of  $\lambda_1$ ,  $\lambda_2$  in the constructor Later this can be used to obtain random numbers  $t1$  and  $t2$  with values that are exponentially distributed with an average of  $\lambda_1$ ,  $\lambda_2$  seconds. I used template <class RealType = double> class exponential\_distribution this class to generate them.

### **Testing TAS function:**

for tas we use test and set function in the while using atomic\_flag named lock and after we calculate the waiting time and max waiting time.

### **Testing CAS function:**

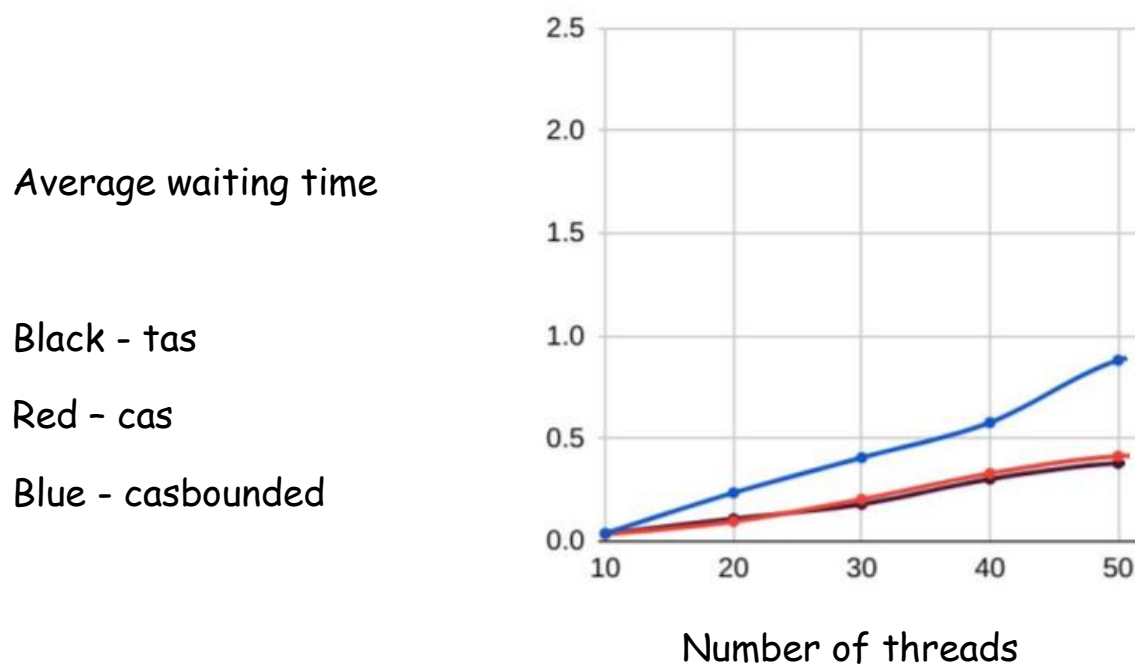
for cas we use atomic<int> named lock and after we calculate the waiting time and max waiting time and at last in the while loop we use

`lock.compare_exchange_strong(a,b)` to decide whether to break the while loop or not.

### Testing CAS-Bounded function:

for cas-bounded we use `atomic<int>` named lock and after we calculate the waiting time and max waiting time and at last in the while loop we use `lock.compare_exchange_strong(a,b)` to change the keyvalue and use both keyvalue and `waitingarray[prevthreadid]` whether to break the while loop or not.

### OUTPUT ANALYSIS:



#### Analysis:

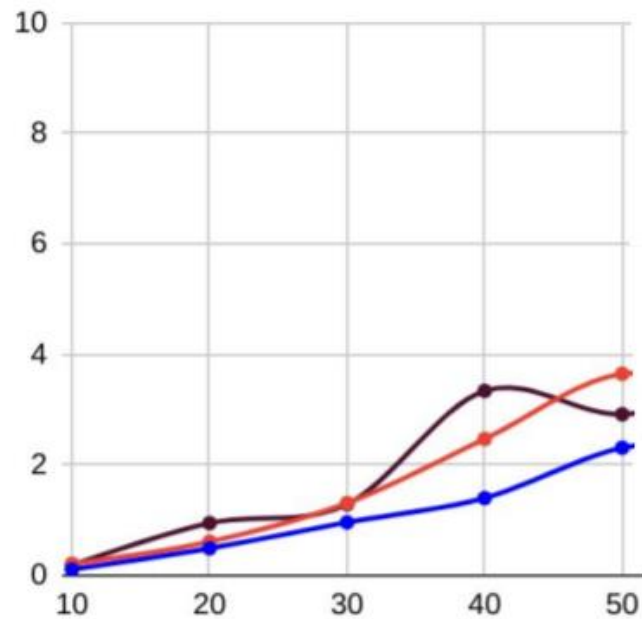
1. Average waiting time taken by TAS, and CAS algorithm is almost the same.
2. Average waiting time taken by Bounded-CAS is greater than both TAS and CAS as it ensures that no thread starve.

MAX waiting time

Black - tas

Red - cas

Blue - casbounded



Number of threads

Analysis:

1. The worst-case waiting time taken by TAS and CAS algorithm is almost the same.
2. The worst-case waiting time taken by Bounded-CAS is much less than both TAS and CAS as it ensures that no thread starves.
3. The difference between the worst waiting times of Bounded-CAS and (TAS, CAS) increases as the no of threads increases.

Conclusion:

\*\* In terms of average waiting time, TAS performs best among all the three ME algorithms whereas CAS-bounded performs worst.

\*\* In terms of worst-case waiting time, CAS-bounded performs best among all ME algorithms whereas CAS/TAS performs worse.