Operating Systems-2

Programming Assignment 3:
Implementing TAS, CAS and CAS with bounded-waiting

Design of the program:

- The variables n,k,lambda1 and lambda2 are declared globally and their values are read from the input file("inp-params.txt").
- A vector of threads called my_threads are created, n in number. These threads runner the function testCS
- The threads are later joined with the main thread.
- In the testCS function, the values for t1 and t2 (sleep times) are calculated from the given values of lambda1 and lambda2.
- An output file is opened to log time stamps of threads into it.
- Each thread goes through the critical section k times for which a for loop is there. In the loop there is a critical section and remainder section.
- The conditions for a thread entering the critical section is different for 3 different source code files. For TAS, a function test_and_set is written using atomic variable target and compare_exchange_strong form atomic library. For CAS, a function compare_and_swap is written like test_and_set. The function for CAS with bounded-waiting is the same as the one for CAS. But the conditions in the critical and exit sections change.
- The timestamps of each thread entering and leaving the critical section are calculated using the libraries chrono and ctime. These are written into the output file along with the thread number(starting from 1) and the number of CS requests(starting from 1).

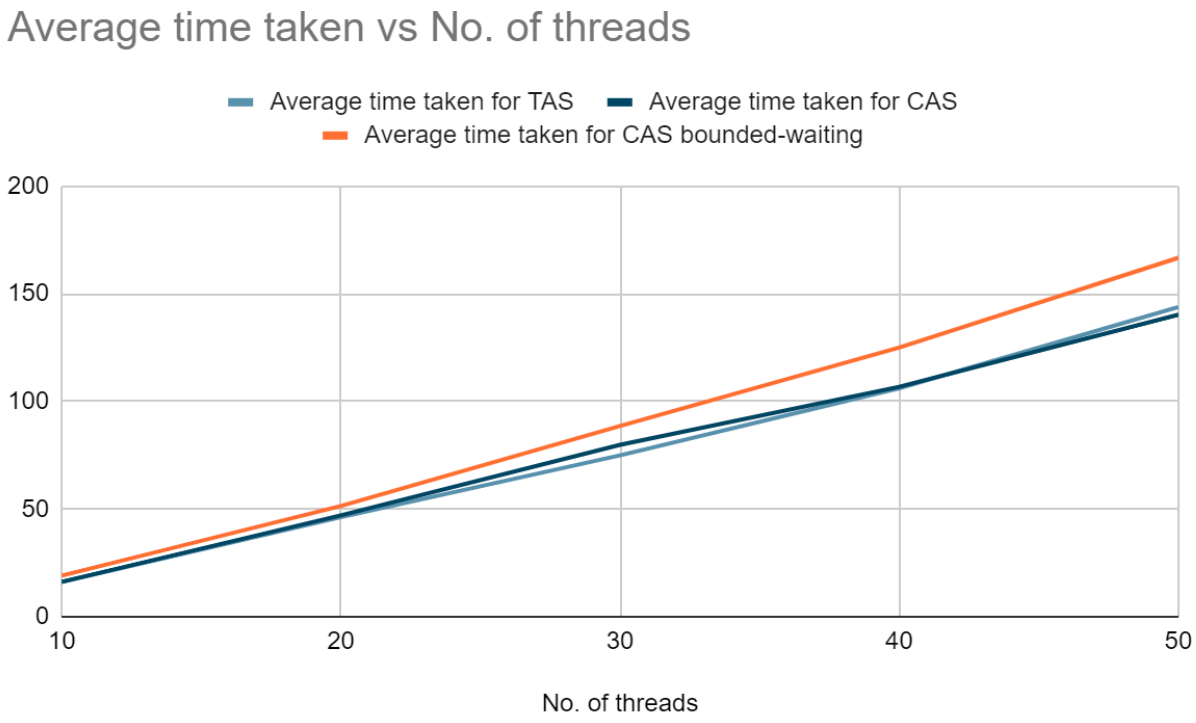
Analysis of the output:

The values of k, lambda1 and lambda2 are fixed as 10,5 and 20 respectively.

Plot1 - Average time vs No. of threads:

No. of threads	Average time taken for TAS	Average time taken for CAS	Average time taken for CAS bounded-waiting
10	16.13	16.19	19.09
20	46.23	47.06	51.43
30	74.94	79.85	88.58
40	106.12	106.817	125.01
50	143.87	140.3	166.72

Note: The above values of time are an average of five trails for the same no. of threads.



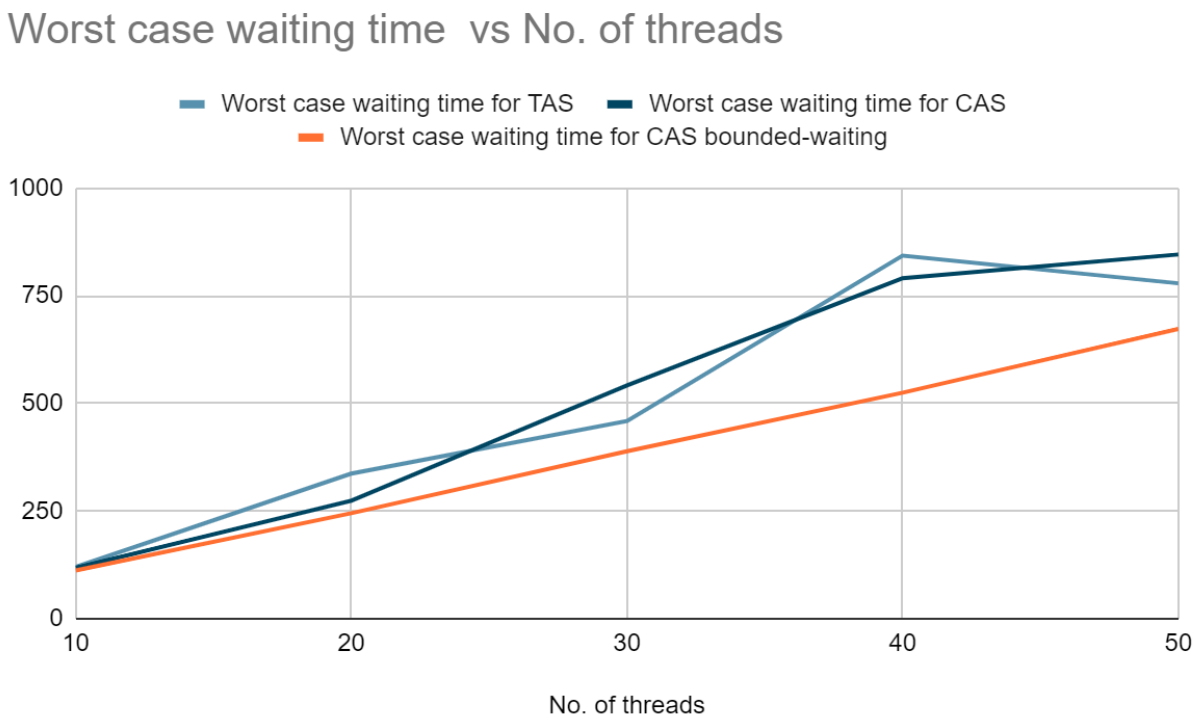
Average time taken for CAS bounded waiting is more than the other two.

Plot2 - Worst case waiting time vs No. of threads:

No. of threads	Worst case waiting time for TAS	Worst case waiting time for CAS	Worst case waiting time for CAS bounded-waiting
10	120	118	112
20	337	274	245
30	459	542	389

40	843	791	525
50	779	846	673

Note: The above values of time are an average of five trails for the same no. of threads.



Unlike average time taken, worst case waiting time is less for CAS bounded waiting.