

# REPORT

## Abstract:

The main objective of this programming assignment is to implement n-thread mutual exclusion using the following methods: Tournament Algorithm, Test-and-set Algorithm instruction and Test-Test-And-Set instruction and compare the performance of the algorithms with respect to the number of threads and number of requests varied from one to the number of logical cores in the machine.

## Implementation:

Lock and unlock methods have been implemented for Tournament Algorithm, Test and Set and Test-Test and set instruction. Java's atomic read and write variables have been used to implement lock and unlock methods of Test and set instruction and Test-Test-and-Set instruction. 2 thread Peterson lock have been implemented and have been used by tournament algorithm for n thread mutual exclusion. Tournament tree is implemented using array data structure.

## Experimental Results:

The experiment is conducted for each algorithm implementation with the following parameters:

### Input Parameters:

Number of threads

Number of requests

### Output Parameters:

Execution time in ms

N Threads	N Requests	TAS Execution	TTAS Execution	Tournament Execution
2	1000	4	2	2
2	10000	8	6	5
2	100000	34	36	36
2	1000000	328	219	584
4	1000	6	4	11
4	10000	35	20	33
4	100000	216	79	179

4	1000000	1282	552	2019
6	1000	8	9	22
6	10000	54	43	54
6	100000	392	102	273
6	1000000	2978	897	2828
8	1000	13	13	29
8	10000	88	54	79
8	100000	696	438	397
8	1000000	5280	4334	3133
10	1000	18	15	42
10	10000	172	70	94
10	100000	1013	244	545
10	1000000	8613	1604	5851
12	1000	32	17	43
12	10000	174	63	113
12	100000	1301	365	700
12	1000000	10572	2632	6977
14	1000	32	24	52
14	10000	241	101	163
14	100000	1565	857	808
14	1000000	14600	2978	7063
16	1000	35	20	48
16	10000	313	86	147
16	100000	1748	514	1122
16	1000000	15685	3907	9910

### Observation:

With reference to the experimental results observed, the following conclusions have been derived.

- 1) TTAS performs relatively well with respect to any number of threads and any number of requests.
- 2) Tournament algorithm performs next to TTAS in terms of execution with any number of threads and large number of requests but doesn't give a good performance if the number of requests is less.
- 3) TAS doesn't give better performance if the number of threads and number of requests are relatively high, but gives good performance if the number of requests and number of threads is moderately less.

**Conclusion:**

The programming assignment provided a good amount of practical knowledge on n thread mutual exclusion both at the conceptual level and implementation level using three different algorithms, and analyzing the performance over different sets of parametric values.