MS3106 Assignment #2

A car-wash facility would like to examine its operations for potential improvement. The facility is open from 8am to 8pm. It stops receiving new customers after 8pm, but will continue serving all cars that are already in service. The car arrival pattern varies over the day and is summarized as the following table.

Time Period	Arrivals per Hour	Time Period	Arrivals per Hour
08:00 – 10:00	18	13:00 – 16:00	30
10:00 – 12:00	22	16:00 – 18:00	25
12:00 – 13:00	26	18:00 – 20:00	20

Two services are offered: *washing* and *vacuum cleaning*.

- The washing service is operated by 3 *technical staffs*. Each staff can only serve one car at any given time, and the service time is exponentially distributed with average 8 minutes. There is a single waiting queue (first-in-first-out) for washing.
- The vacuum cleaning is self-operated at 2 *machines*, A and B. Each machine can serve one car at any given time, and the service time is distributed as EXPO(5) in minute. A separate waiting queue (first-in-first-out) exists for each machine.

When a car arrives, if the number of cars waiting for washing is less than or equal to 3, it goes to washing; otherwise, it leaves the facility immediately. After washing is complete, they go for vacuum cleaning and leave the facility. In particular, the car would go to the machine for vacuum cleaning with the shortest waiting queue, and if there is a tie, the car goes to machine A because it is closer.

Build a simulation model using Arena, run 30 replications with replication length 1 day, and report the following performance indicators in a word/text file:

1. The average and 95% confidence interval (CI) of the number of waiting cars in each queue.
2. The average and 95% CI of the total time per car spend in each process.
3. The average and 95% CI of the percent of cars leaving the facility with no service received.

Hints:

- The simulation can only terminate after all remaining cars have left the facility and the simulation time passed 8pm;
- Check both Queues and Processes in Statistics Collection of run setup.