C / C++ Programming Skills Paper For MCSE (Networking)

As part of the MCSE assessment, we want to focus more on the concepts of IPC, rather than file operations, particular for the minds that are associated with Networking Domain.

The focus therefore would be demonstrated usage of the following:

1. Multi Process
   1. Semaphores
   2. Shared Memory
   3. Socket Communication
2. Multi Thread
   1. Mutex
   2. Message Queues

# Problem Statement

To develop simulation software for Car Parking System, with the following specifications:

1. There are two processes which form part of this system, an EntrySystem Process and an ExitSystem Process. ( Multiprocessing)
2. There are 2 entry points, under the control of EntrySystem Process and 3 exit points under the control of ExitSystem Process.
3. The parking system can accommodate at max 100 cars.
4. Each point within the system is serviced by a separate thread. (Multithread)
5. There is some data that is shared between the Entry and Exit System, that is:
   1. Car Number
   2. Owner Token ID ( The token ID is generated when the car gets entry)
   3. Entry Time

This specification stresses on usage of Shared memory.

1. A car is given exit only when the Token ID and the Car Number match.
2. Once a car exits, the record is deleted.
3. At any point of time, only one exit gate can be open. ( Usage of Condition Variables)
4. A car is given entry only when there is at least one space available.
5. If there is no space available, the car are given waiting number, on first come first serve basis and one of the entry gate is opened once a car exits.( Usage of Counting Semaphore).
6. At the point of entry, there is additional security information collected , which is with the EntrySystem only and not shared with other software:
   1. Name of the driver
   2. Name of driver’s mother
7. In a situation when the driver exiting the parking is unable to present the token, the ExitSystem can query the EntrySystem. In such an event, the EntrySystem would receive the request and provide the details. ( This point stresses on usage of socket communication between the processes)
8. The query, since it can come as part of execution of any of threads that are servicing the exit points, has to be coordinated by the ExitSystem. A msg que would be used for communication. Note that there is no communication expected within the exit points.( This specification stresses on usage of MsgQ for communication between the main processes and the multiple threads).
9. A simple CLI which would enable a user to test all of the requirements above.

## Submissions Expected from the Participant

1. Design Document, which need not be wordy, but would necessarily have:
   1. Flow Chart, Use case diagrams
   2. Assumptions
2. Well Commented Code
3. Test Cases and execution report.
4. And of course, the code.

The above has to be submitted in a zipped directory with the following structure: