National University of Computer and Emerging Sciences

Formal Methods (SE2003)

Sessional-I Exam

Date: 24th February 2025

Course Instructor(s)

Dr.Wafa Basit

Total Time: 1 Hours
Total Marks: 25
Total Questions: **1**

Semester: SP-2025
Campus: Lahore
Dept: Software Engineering

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Student Name Roll No Section Student Signature

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Instructions

- Make assumptions where necessary
- In case of multiple solutions, mention the final one
- All Questions have to be attempted on question paper.
- Please draw neat and understandable diagrams
- Use of lead pencil is not allowed.

Question # 1 A simple control system monitors the entry and exit of vehicles from a car park. It maintains a count of the number of vehicles presently inside; this count should never exceed *capacity*, an integer number greater than zero**.** ***Whereis*** is a partial function that maintains the locations of the parked cars in the parking: **(Total Points 25, 5 marks each)**

CarParking

$Count : \mathbb{N}$

$Whereis : Car \mapsto Location$

$Count \leq Capacity$

Note: Only write the success scenarios for each operation. Don't use the names of input and output variables that are same as the existing key words. Write necessary pre and post conditions

a) A successful park operation allocates a location to a new car. The car and location both will be provided by the user. The location should not be already occupied. It also increments the counter by one.

CarPark

b) A successful exit operation removes the car from the car parking and decrements the counter.

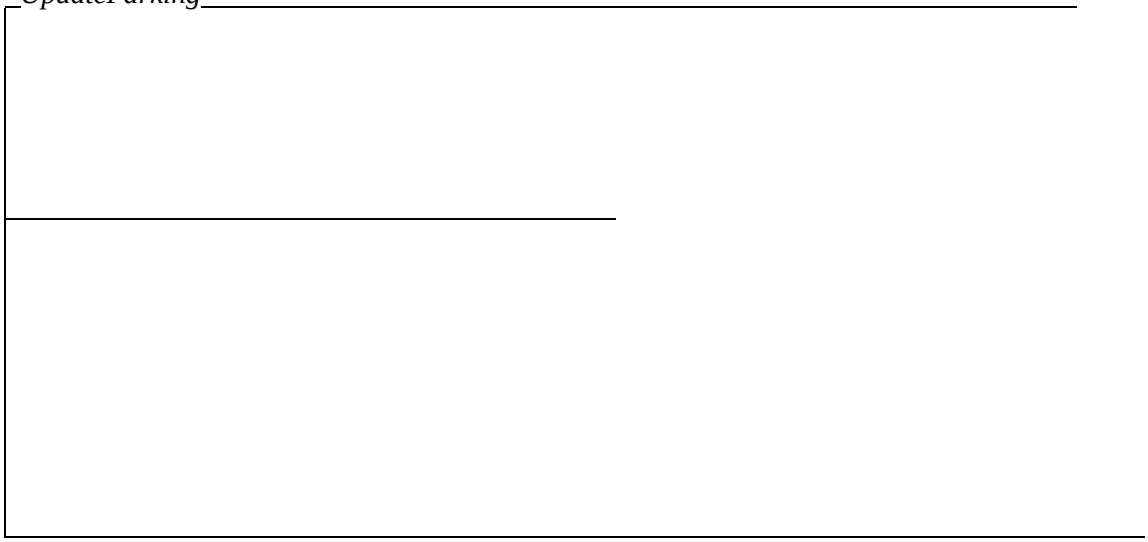
CarExit

c) A successful UpdateParking operation changes the location of already parked car to a new location (it should not be ;aready occupied) and the count remains the same:

UpdateParking

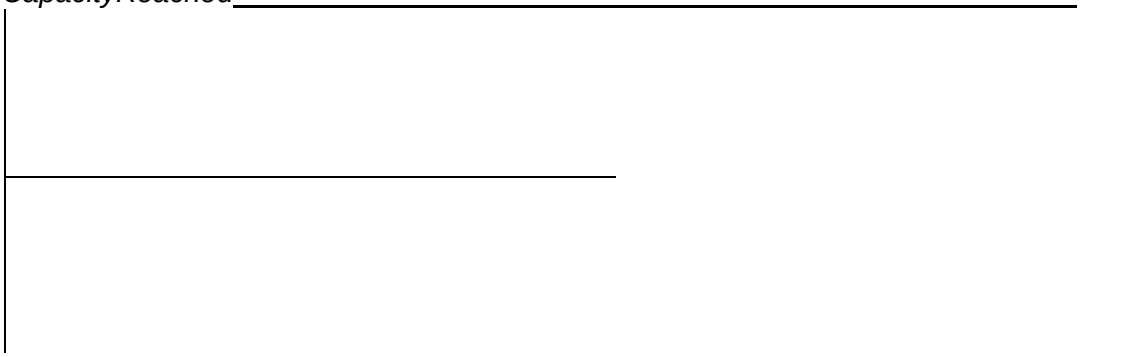
d) A successful ViewParking operation returns the location of already parked car and the count remains the same:

UpdateParking



e) An unsuccessful park operation has a complementary precondition. This time, the count is equal to capacity. A new entry shall not be made and a message will be displayed telling that no space is available.

CapacityReached



f) Draw a petrinet to model the car park scenario defined in part a.

-------Good Luck-----