ECE 321: Software Requirements Engineering Fall 2018

Assignment 3 (individual work; 10 pts total)

1. (10 pts) Complete the following algebraic specification for an abstract data type describing a queue of cars at an intersection by providing axioms.

algebra QueueOfCars
imports Integer, Boolean;
introduces
sorts Queue, Car;
operations
New: → Queue;
CarArrives: Car x Queue → Queue;
CarDeparts: Queue → Queue;
IsEmpty: Queue → Boolean;
NumberOfCars: Queue → Integer;
Longer: Queue x Integer → Boolean;
FirstCar: Queue → Car;
Equal: Queue x Queue → Boolean;
WhichQueue: Queue x Queue x Car → Integer;
Position: Car x Queue → Integer;
constrains New, CarArrives, CarDeparts, IsEmpty, NumberOfCars, Longer, FirstCar, Equal, WhichQueue, Position, so that Queue generated by [New, CarArrives]

IMPORTANT NOTES

- Description of the operations:
  - CarArrives adds a car to the end of a queue
  - CarDeparts removes a car from the front of a queue (the other side than the one where we add cars)
  - IsEmpty returns true if a queue of cars is empty and false otherwise
  - Longer returns true if a queue is longer than the integer and false otherwise (assume that the integer is never negative)
  - NumberOfCars returns the number of cars in the queue
  - FirstCar returns the car from the front of the queue without deleting it
  - Equal returns true if number of cars in two queues is equal and false otherwise
  - WhichQueue examines two queues and returns 1 if a given car is in the first queue, 2 if the car is in the second queue, and 0 if the car is not in the queues.
  - Position examines if a given car is in a queue and returns the number of cars that are in front of this car in the queue (closer to the front of the queue) or -1 if this car is not in the queue
- You should provide only the axioms (including the for all and end statements)
- Be precise in terms of both syntax and symbols that you use
- Assume that error constant is available
  - Assume that applying CarDeparts to empty queue generates error
  - Assume that applying FirstCar to empty queue generates error
  - Assume that = = and + operators are defined for the sort Integer
- Write neatly (preferably using a word processor)

Due Dates and Notes

Your assignment must be received by 11:00 pm MST, November 1 (Thursday), 2018. Your assignment should be submitted via eClass.