Assignment: Developing a Z-Schema for an Ordered Queue

In this assignment, you will develop a formal specification using Z-schema for an . An ordered queue is a queue where elements are always maintained in ascending order. You will define the state of the queue and specify the operations for Enqueue, Dequeue, IsEmpty, and IsFull.
Define the basic types and state schema for an ordered queue.Specify the Enqueue operation, ensuring that the new element is inserted in the correct position to maintain the ascending order.Specify the Dequeue operation, which removes and returns the smallest element in the queue.Specify the IsEmpty operation, which checks if the queue is empty.Specify the IsFull operation, which checks if the queue has reached its maximum capacity.:

- Define the state of the queue, including the sequence of elements and the maximum size.
- Include an invariant to ensure the sequence is always sorted in ascending order.

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- Define the initial state of the queue, where it is empty.

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- Ensure the new element is inserted in the correct position to maintain the ascending order.
- Include a precondition to check if the queue is not full.

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- Remove and return the smallest element in the queue.
- Include a precondition to check if the queue is not empty.

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- Return true if the queue is empty, otherwise false.

- Define the initial state of the queue, where it is empty.

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- Ensure the new element is inserted in the correct position to maintain the ascending order.
- Include a precondition to check if the queue is not full.

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- Remove and return the smallest element in the queue.
- Include a precondition to check if the queue is not empty.

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- Return true if the queue is empty, otherwise false.

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- Return true if the queue has reached its maximum capacity, otherwise false.

Write the Z-schema for the ordered queue, including all required operations using Z Plugin for wordEnsure that your schemas are well-formatted and include comments to explain each part.Submit your work as a PDF or text file. (50%): The schemas must accurately model the behavior of an ordered queue. (30%): All required operations (Enqueue, Dequeue, IsEmpty, IsFull) must be included. (20%): The schemas should be well-documented and easy to understand.

- Use the seq type to represent the sequence of elements in the queue.
- Use invariants to enforce the ordering constraint.
- For the Enqueue operation, think about how to insert an element into a sorted sequence while maintaining the order.

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