Exercise: Stack and Queue

1.

1. Explain queue data structure. (4 marks)

Queue is a data structure that arranges and accesses its elements using the first-in-first-out (FIFO) method, that is elements that are inserted first will be removed first. Queue data structure is implemented by using a data variable and a pointer that points to the next element in the queue, and also a front and rear pointer that points to the first and last element of the queue respectively. The operations that are used for queue are enqueue and dequeue. Enqueue inserts an element at the rear of the data structure, while dequeue removes an element at the front of the queue.

1. The diagram below shows the structure of a queue.

Tail

Head

Null

Jasmine

Hibiscus

Orchid

Lily

Rose

The following sequence of operations is to be performed on this queue. Draw

the queue, as it would appear after each operation is executed one after another.

1. Two items are removed

Null

Hibiscus

Orchid

Lily

1. One item is removed

Hibiscus

Orchid

Null

1. Lily is added

Null

Hibiscus

Orchid

Lily

(iv) Three items are removed

Null

1. Jasmine and then rose are added

Null

Rose

Jasmine

# (vi) One item is removed

Rose

Null

# (12 marks)

(c) Using the diagram given below, explain the algorithm of deleting a node at front of a list.

Head

India

USA

UK

NULL

1. **marks)**
2. State whether a stack or queue is an appropriate data structure for each of the

following situations.

1. Customers waiting in line at an ATM machine

Queue

1. Customers at a bookshop cashier counter.

Queue

1. Program P calls subprogram Q, which called another subprogram R and so on.

Stack

1. Paper at the photocopying machine that is ready to be used.

Stack

**(4 marks)**

1. State two differences between the Stack and Queue data structures, with respect to the order in which nodes are added and deleted, and the positioning of additions and deletions. **(4 marks)**

Stack adds nodes at the top of the structure, while Queue adds nodes at the rear of the structure. Stack deletes nodes at the top of the structure, while Queue deletes nodes at the front of the structure.

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