



UNIVERSITY
RWANDA

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Level 2 BIT

EXERCISE OF DATA STRUCTURE AND ALGORITHM

PART I -STACK

A. BASICS

Q1: LIFO nature of stacks means that which added last removed first, And even if we are filling payment details and pressing back then the system take the recently stored data(details for last step) and remove it from storage(database system).

Q2: The action of pressing back while we navigate course modules it undoes the last step and this action is simiral to popping froma stack because both removes the last stored data from the list.

B. APPLICATION

Q3: In BK Mobile Banking, transactions are added to history. SO the way a stack could enable the undo function when correcting mistakes is by allowing the system user to remove transactions with errors from the last added one to where the mistakes began from.

Q4: Stacks can ensure forms are correctly balanced by Push opening

bracket and pop when matching closing bracket is found also called Stack-based matching , which allows tus to provide only required details.

C. LOGICAL

Q5: The task which is next is Group assignment.

Q6: The answer which will remain in the stack after undoing is 4th recent action.

D. ADVANCED THINKING

Q7: In RwandaAir booking, A stack enable this retracing process by helping a passenger to overview the details before submitting the form.

Q8: "umutware ni umwana"

Q9: DFS using a stack: A stack is better suited for a deep search (DFS) of a library's shelves than a

queue. A stack's LIFO nature means it prioritizes exploring one path or branch as deeply as possible before backtracking. A queue, which is First-In, First-Out (FIFO), would be better for a

breadth-first search, where all items at one level are explored before moving to the next level.

Q10: Push/pop for Navigation: A feature using stacks for transaction navigation in an app like BK

Mobile could be a "Go Back to Previous State" button. When a user navigates from a transaction

list to view a specific transaction, the list state is pushed onto a stack. If they view another transaction, that state is also pushed. The "Go Back" button would pop the current state, returning the user to the previous screen.

PART II -QUEUE

A. BASICS

Q1: Enqueue (add at rear), Dequeue (remove from front): At a restaurant in Kigali, customers are served in the order they arrive. This is a perfect example of FIFO behavior, as the first person in line is the first person to be served. In a queue, an item is added at the rear (end) of the line, which is called an enqueue operation, and an item is removed from the front of the line, which is a dequeue operation.

Q2: Dequeue (next items leaves first.): A YouTube playlist, where the next video plays automatically, is also an example of a dequeue operation, as the video at the front of the playlist is the next to be removed and played.

B. APPLICATION

Q3: Enqueue (job submission): The line of people waiting to pay taxes at RRA offices is a real-life example of a queue. Each person is enqueued as they arrive and dequeued when they are served.

Q4: Queue management:

Improving Customer Service: Queues improve customer service at places like MTN/Airtel service

centers by ensuring that SIM replacement requests are processed in the order they are received.

This provides a fair and predictable system, reducing waiting time uncertainty and perceived unfairness.

C. LOGICAL

Q5: Sequence of Enqueue/Dequeue: In a sequence of bank operations: Enqueue("Alice"),

Enqueue("Eric"), Enqueue("Chantal"), Dequeue (), Enqueue("Jean"). After Alice is dequeued, Eric is at the front of the queue.

Q6: FIFO message handling

Fairness in Handling Applications: A queue ensures fairness in handling RSSB pension applications by processing them strictly in the order of arrival. This guarantees that no application

can jump the line, promoting a fair and transparent system.

D. ADVANCED THINKING

Q7: Different Queue Types:

Linear Queue: A line of people at a wedding buffet is a linear queue. They move in a straight line

from the start to the end of the line.

Circular Queue: Buses looping at Nyabugogo bus station can be modeled as a circular queue.

When a bus leaves, the empty space can be filled by another bus, creating a continuous loop of

service.

Deque: A bus allows boarding from both the front and rear, which is an example of a double ended queue (deque). Items can be added or removed from both ends.

Q8: Enqueue orders, dequeue when ready

Modeling Restaurant Orders: A queue can model a restaurant's order process by using an enqueue operation for each customer's food order and a dequeue operation when the food is

ready and the customer is called.

Q9: Priority Queue: At CHUK hospital, emergencies are treated as a priority queue because they

are served immediately, regardless of their arrival time. Unlike a normal queue, a priority queue

processes items based on their urgency or importance, not just their arrival order.

Q10: Enqueue /dequeue Matching System : Queues can fairly match drivers and students in a taxi

app. Drivers waiting for a passenger are enqueued in the order they become available.

When a

student requests a ride, the driver at the front of the queue is dequeued and matched with the

student.