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Module:Data structure and algorithm assignment 2

Part I: Stack

Q1: Q1: How does this show the LIFO nature of stacks?
In a stack, the last item you add is the first one you remove. The MTN MoMo app shows this when you press “back.” The most recent detail you entered is removed first, just like popping from a stack.

Q2: Q2: Why is this action similar to popping from a stack?
When you press “back” in UR Canvas, you undo the last page or step. This is similar to popping from a stack, because the system removes the latest action first.

Q3: How could a stack enable the undo function when correcting mistakes?
A stack can store every action (like typing, deleting, or moving). If a mistake happens, the undo button pops the last action. This lets you return to the previous correct state.

Q4: How can stacks ensure forms are correctly balanced?
In forms, every opening field must match a closing one (like brackets). A stack checks balance by pushing every start symbol and popping it when the matching end comes. If all match, the form is correct.

Q5: Which task is next (top of stack)?

Order: Push “CBE notes,” Push “Math revision,” Push “Debate,” Pop → removes “Debate.” Then Push “Group assignment.” Top of stack = “Group assignment.”

Q6: Which answers remain in the stack after undoing?

If a student undoes three recent actions, the last three items are popped out. Only the older answers remain in the stack, showing what is still kept after undo.

Q7: How does a stack enable this retracing process?
When booking a ticket, every step is stored in a stack. If the passenger wants to go back, popping removes the last step and reveals the previous one. This way, retracing is possible.

Q8: Show how a stack algorithm reverses the proverb.
To reverse “Umwana ni umutware”: Push “Umwana,” Push “ni,” Push “umutware.” Then pop gives “umutware ni Umwana.” This is how a stack reverses word order.

Q9: Why does a stack suit this case better than a queue?

In library deep search, you keep going deeper on one shelf before returning. A stack suits this because it

always follows the “last entered shelf first” rule. A queue would not work since it serves first-come-first-serve, not deep searching.

Q10: Suggest a feature using stacks for transaction navigation.

In BK Mobile, a stack feature can allow customers to move back and forth in transaction history. Push new transactions, and pop lets them return to older ones step by step.

Part II: Queue

Q1: How does this show FIFO behavior?

At a Kigali restaurant, the first customer in line is served first, and new customers wait at the end. This is exactly FIFO (First-In, First-Out).

Q2: Why is this like a dequeue operation?

In a YouTube playlist, the next video plays automatically after the previous one finishes. The first video added is the first to leave, just like dequeue

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Q3: How is this a real-life queue?

At RRA, people line up to pay taxes. The first to arrive is the first served. This real-life situation is a queue.

Q4: How do queues improve customer service?

In MTN/Airtel service centers, customers are served in order. Queues help avoid confusion and ensure fairness in handling requests.

Q5: Who is at the front now?

Order: Enqueue Alice, Eric, Chantal. Dequeue → Alice leaves. Then Enqueue Jean. Queue = [Eric, Chantal, Jean]. Front = Eric.

Q6: Explain how a queue ensures fairness.

RSSB pension cases are solved in arrival order. A queue ensures fairness because nobody can skip the line; everyone is served in order.

Q7: Explain how each maps to real Rwandan life.

Linear queue = people lining for food at a wedding buffet (straight line).

Circular queue = buses at Nyabugogo looping back for another trip.

Deque = people boarding a bus from either front or rear door.

Q8: How can queues model this process?

In a restaurant, customers order (enqueue). When food is ready, their order is dequeued and served. This models the food service process.

Q9: Why is this a priority queue, not a normal queue?

At CHUK, emergencies are treated first even if they arrived later. This is a priority queue because some cases jump ahead due to urgency.

Q10: How would queues fairly match drivers and students?

In a moto app, riders wait in line. Passengers are matched in arrival order. Queues ensure fairness so the first rider waiting is paired first with a student.
