Part one stack

A: Basics

Q1. How does this show the LIFO nature of stacks?
According to stacks work on the rule Last In, First out (LIFO*)*. For example, in the MTN MOMO app:

Step 1: Choose service

Step 2: Enter phone number

Step 3: Enter amount

Step 4: Confirm payment.
When pressing Back, Step 4 disappears first, then Step 3, and so on. This shows LIFO, where the most recent action is undone first.

Q2. Why is this action similar to popping from a stack?
The Pop operation involves in removing the top item in a stack. For example, In the UR Canvas app, navigation might look like: (Course, Module, Lecture, and Quiz). Pressing back removes Quiz first, then Lecture. This is the same as popping from a stack.

Part B: Applications

Q3. How could a stack enable the undo function when correcting mistakes?
Every action is pushed into the stack. If a mistake is made, undo simply pops the last action. Example: Airtime, Bills, Money Transfer. Undo removes Money Transfer first.

Q4. How can stacks ensure forms are correctly balanced?
Stacks ensure forms are correctly balanced by pushing when an opening field appears (e.g., *Start Section*) and popping when the matching closing field (End Section) is found. If the stack is empty at the end, the form is properly matched.

Part C: Logical

Q5. Which task is next (top of stack)?
Tasks pushed including CBE notes, Math revision, Debate. Then, after popping *Debate* and pushing Group assignment, the top of stack is Group assignment, meaning it's the next task.

Q6. Which answers remain in the stack after undoing?
Answers pushed (A1, A2, A3, A4, A5). Undoing three pops leaves [A1, A2]. So only the first two remain.

Q7. : How does a stack enable this retracing process?
Passenger involves in the following while filling form steps:

1. Name
2. Passport
3. Seat
4. Payment

Each step is pushed. Pressing back pops Payment, then *Seat*. This allows retracing step by step.

Q8. Show how a stack algorithm reverses the proverb
referring to example in question of Proverb: "Umwana ni umutware." Push each word into the stack: (Umwana, ni, umutware). Popping reverses the order will be umutware ni Umwana.

Part D: Practical Use

Q9. Why does a stack suit this case better than a queue?
DFS means (Depth-First Search) uses a stack involves in go deep first, then backtrack. For example: Shelf A → Row 1 → Book 3. If the book isn't correct, pop and backtrack. A queue would explore level by level (BFS), which is slower for deep search. Thus, stacks suit DFS better.

Q10**. Suggest a feature using stacks for transaction navigation.**
According to example in question, BK Mobile Stacks can improve transaction navigation. Each visited page like Deposit, Transfer, and Payment is pushed into a stack. Pressing Back pops Payment, and a second stack can allow Forward navigation. This works like browsing history in web browsers

# PART TWO QUEUE

# A. Basics

Q1. How does this show FIFO behavior?
A queue follows First In, First Out (FIFO). In a restaurant line, the first customer to arrive is the first to be served, and the last to arrive waits longer. This is exactly how FIFO works.

Q2. Why is this like a dequeue operation?
In a YouTube playlist, the next video starts playing automatically and is then removed from the list. This is like a Dequeue operation, which removes the front item before moving to the rest.

# B. Applications

Q3. How is this a real-life queue?
At Rwanda Revenue Authority (RRA), taxpayers form a line. Each person Enqueues at the rear, and officers serve customers from the front. This is a direct example of a real queue.

Q4. How do queues improve customer service?
At telecom service centers, SIM replacement requests are handled in order of arrival. Queues improve fairness, reduce confusion, and ensure each customer is served in turn.

# C. Logical

Q5. Who is at the front now?
Let dive it into Steps:

- Enqueue(Alice) → (Alice)
- Enqueue(Eric) → (Alice, Eric)
- Enqueue(Chantal) → (Alice, Eric, Chantal)
- Dequeue() → removes Alice → (Eric, Chantal)
- Enqueue(Jean) → (Eric, Chantal, Jean)

Answer: The person at the front is Eric.

Q6. : Explain how a queue ensures fairness.
According to example in question of RSSB processes pension applications in arrival order. The FIFO rule ensures fairness: the first applicant is served first, while late applicants must wait. No one can skip the line.

# D. Advanced Thinking

Q7. Explain how each maps to real Rwandan life

Q8.How can queues model this process?
According to example of restaurant order Kigali, Customers order food then orders are Enqueued as they arrive. When ready, meals are Dequeued and called out in the same order. This models the serving process fairly and efficiently.

Q9. Why is this a priority queue, not a normal queue?
For instance, At CHUK, emergencies are treated first, even if they arrive later than other patients. This is a priority queue, not a normal FIFO queue, because urgency decides order instead of arrival time.

Q10. How would queues fairly match drivers and students?
By referring to example of E-Bike app matching, in ride apps:

1. Drivers wait in one queue.
2. Passengers wait in another queue.
   The system Dequeues the earliest driver and the earliest passenger, pairing them fairly.
   This ensures no driver or passenger is skipped.