Part I — STACKS

A. Basics

Q1: MTN MoMo app and LIFO behavior
When filling payment details step-by-step, each new screen (e.g., amount, recipient, confirmation) is pushed onto the stack. Pressing "Back" pops the last screen, showing the previous one. This reflects LIFO: the last entered detail is the first removed.

Q2: UR Canvas and Pop (Undo)
Navigating course modules step-by-step adds each module to the stack. Pressing "Back" pops the most recent module, undoing the last navigation. This mirrors how popping removes the top item in a stack.

B. Application

Q3: BK Mobile Banking and Undo
Each transaction is pushed onto the history stack. If a mistake occurs, popping the last transaction (undo) removes it. This allows users to backtrack and correct errors, just like undoing recent actions in a stack.

Q4: Irembo form and Balanced Parentheses
Stacks help match opening and closing brackets. In forms, each opened section (e.g., personal info, ID details) is pushed. When a section is completed, it's popped. If sections are mismatched (e.g., skipped or closed prematurely), the stack detects imbalance, ensuring proper completion.

C. Logical

Q5: Task Stack Sequence
Sequence:

- Push("CBE notes")
- Push("Math revision")
- Push("Debate")
- Pop() → removes "Debate"
- Push("Group assignment")
  Top of stack: "Group assignment"

Q6: Undoing 3 Actions in ICT Exam
If a student had:

- Push("Answer 1")
- Push("Answer 2")
- Push("Answer 3")
- Push("Answer 4")
  Undoing 3 actions (Pop x3) leaves only "Answer 1" in the stack.

D. Advanced Thinking

Q7: RwandAir Booking and Backtracking
Each form step (e.g., passenger info, flight selection, payment) is pushed. Going back pops the last step, allowing users to retrace their steps in reverse order—just like stack backtracking.

Q8: Reversing "Umwana ni umutware"
Stack algorithm:

- Push("Umwana")
- Push("ni")
- Push("umutware")
  Then Pop each:
- Pop() → "umutware"
- Pop() → "ni"
- Pop() → "Umwana"
  Reversed: "umutware ni Umwana"

Q9: DFS in Kigali Library
DFS explores deeply into one shelf before backtracking. A stack helps track visited shelves. Unlike a queue (which explores broadly), a stack suits deep search by storing paths and allowing backtracking.

Q10: BK Mobile Navigation Feature
Feature: "Recent Transactions Stack"
Each viewed transaction is pushed. Users can press "Back" to pop and return to the previous transaction. This stack-based navigation improves user control and history tracking.

🟩 Part II — QUEUES

A. Basics

Q1: Kigali Restaurant and FIFO
Customers arrive and are served in order. The first to arrive is the first to be served—classic FIFO behavior, just like a queue.

Q2: YouTube Playlist and Dequeue
Videos are played in the order they were added. The next video (front of queue) is dequeued and played automatically, just like removing the front item in a queue.

B. Application

Q3: RRA Tax Queue
People waiting to pay taxes form a line. Each person is enqueued at the rear and served from the front. This models a real-life queue system.

Q4: MTN/Airtel SIM Replacement
Requests are processed in order of arrival. Queues ensure fairness and efficiency, reducing wait time confusion and improving customer satisfaction.

C. Logical

Q5: Equity Bank Queue Sequence

- Enqueue("Alice")
- Enqueue("Eric")
- Enqueue("Chantal")
- Dequeue() → removes "Alice"
- Enqueue("Jean")
  Front of queue: "Eric"

Q6: RSSB Pension Applications
Applications are handled in order of arrival. A queue ensures fairness by preventing jumping the line—everyone is served based on when they joined.

D. Advanced Thinking

Q7: Queue Types in Rwanda

- **Linear queue:** Wedding buffet—people line up and move forward as food is served.
- **Circular queue:** Nyabugogo buses loop around and rejoin the queue after completing a trip.
- **Deque:** Boarding buses from front or rear—passengers can enter or exit from either end.

Q8: Kigali Restaurant Orders
Customers place orders (enqueue). When food is ready, they're called (dequeue). This models a queue where items are processed and removed in order.

Q9: CHUK Hospital Priority Queue
Emergencies are treated first, regardless of arrival time. This is a priority queue—patients with higher urgency are dequeued before others.

Q10: Moto/E-bike App Matching
Riders (drivers) and passengers are enqueued. The system matches the front of each queue fairly—first-come, first-served—ensuring balanced and timely service.