Part I – STACK

A. Basics

Q1: How does the MTN MoMo back button show LIFO nature?
* Because the last detail entered (e.g., phone number, amount, PIN) is the first one removed when pressing Back. This follows Last In, First Out.

Q2: Why is Canvas back navigation like popping from a stack?
* Each navigation step is pushed onto the stack. Pressing back removes the most recent (top) step, just like `pop` removes the top of a stack.

B. Application

- Q3: How could a stack enable the undo function?

  Each user action (typing, transaction, etc.) is pushed. When undoing, actions are popped in reverse order, restoring the previous state.

Q4: How can stacks ensure forms are balanced?
* Each opening field (like "Start date") is pushed. When its matching closing field (like "End date") appears, it is popped. If any opening is unmatched, the form is unbalanced.

C. Logical

Q5: Push("CBE notes"), Push("Math revision"), Push("Debate"), Pop(), Push("Group assignment")

- Start: [CBE notes]
- Push Math revision → [CBE notes, Math revision]
- Push Debate → [CBE notes, Math revision, Debate]
- Pop → removes Debate → [CBE notes, Math revision]
- Push Group assignment → [CBE notes, Math revision, Group assignment]

*Top of stack = Group assignment

Q6: Student undoes 3 actions.
* If 3 actions are popped, only the earlier (older) answers remain.
Example: [A1, A2, A3, A4, A5]. Undo 3 → pop A5, A4, A3 → stack = [A1, A2].

D. Advanced Thinking

Q7: How does a stack enable retracing (RwandAir booking)?
* Each step (passenger details, flight, payment) is pushed. When going back, steps are popped in reverse order until the desired step is reached.

Q8: Reverse "Umwana ni umutware".

- Push: [Umwana], [ni], [umutware]
- Pop → "umutware ni Umwana"

Stack reverses the word order.

Q9: Why stack suits DFS in Kigali Library?
DFS goes deep into shelves before backtracking. A stack remembers the last unexplored shelf, so when backtracking, it pops and continues correctly.

Q10: Suggest a feature for BK Mobile navigation.
A transaction undo/redo feature: recent navigations (or edits) are pushed; users can pop to return to the last viewed transaction.

Part II – QUEUE

Q1: How does restaurant serving show FIFO?
* First customer enters → first served. The first to join the queue is the first to leave: First In, First Out.

Q2: Why is autoplay in YouTube like dequeue?
* The front video in the playlist is played (removed), and the next one in order moves forward—like `Dequeue()`.

B. Application

Q3: How is RRA tax line a real queue?
* Each taxpayer joins the line at the rear and is served in order at the front.

Q4: How do queues improve customer service?
* They prevent jumping the line, serve fairly, and keep track of order, making the process smooth.

C. Logical

Q5: Enqueue("Alice"), Enqueue("Eric"), Enqueue("Chantal"), Dequeue(), Enqueue("Jean")

- Start: []
- Enqueue Alice → [Alice]
- Enqueue Eric → [Alice, Eric]
- Enqueue Chantal → [Alice, Eric, Chantal]
- Dequeue → removes Alice → [Eric, Chantal]
- Enqueue Jean → [Eric, Chantal, Jean]

* Front = Eric

Q6: How queue ensures fairness in RSSB?
* Applications are processed in the order received. No skipping—so FIFO guarantees fairness.

D. Advanced Thinking

Q7: Real-life mappings:

- Linear queue = Wedding buffet line (straight order, no cycle).
- Circular queue = Buses at Nyabugogo terminal (last bus returns to join rear).
- Deque = Boarding bus from front or rear (insertion/removal at both ends).

Q8: How do queues model Kigali restaurant food orders?
* Orders are enqueued as customers request. When ready, food is dequeued and served to the correct customer.

Q9: Why CHUK emergencies = priority queue?
* Patients are not served strictly FIFO. Emergencies “jump the line” → handled by priority, not arrival time.

Q10: How would moto app match drivers & students fairly?
* Passengers are enqueued in order. Drivers are also queued. When one is free, the front passenger and driver are matched → FIFO fairness.