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BIT YEAR TWO

BIT EXERCISE

Q1: ANSWER

STUCK; stack is a data structure where elements are added (pushed) and removed (popped) from the same end, following LIFO (Last In, First Out).

POP; Remove and return the top item.

PUSH; Add an items to the top

BASICS

Q1**: How does this show the LIFO nature of stacks?**

The LIFO (Last In, First Out) nature of stacks is demonstrated in the MTN MoMo app example, where filling payment details step-by-step and pressing back removes the last step added first. This mirrors how a stack operates: the most recently added item is the first to be removed.

Q2**: Why is this action similar to popping from a stack?**

Pressing back in the UR Canvas app to undo the last navigated course module is similar to popping from a stack because it removes the most recently added item (the last module visited) first, just like the pop operation top item in a stack removes the.

APPLICATION

Q3: **How could a stack enable the undo function when correcting mistakes?**

A stack can enable the undo function by storing each transaction in BK Mobile Banking history as it is added (pushed). To undo a mistake, the most recent transaction is removed (popped), allowing the user to revert to the previous state step-by-step.

Q4**: How can stacks ensure forms are correctly balanced?**

In Irembo registration forms, stacks ensure correct balancing by pushing an opening bracket onto the stack and popping it when a matching closing bracket is found. If the stack is empty at the end

or contains unmatched brackets, the form is unbalanced, indicating an error in the data entry fields.

LOGICAL

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

The next task is "Group assignment" because it was the last item pushed before the Pop operation, and in a stack, the top item is the most recently added.

Q6: **Which answers remain in the stack after undoing?**

After undoing 3 recent actions during ICT exams, the stack will contain the initial tasks up to the point before the last 3 pushes. Starting with an empty stack, the sequence is: Push ("CBE notes"), Push ("Math revision"), Push("Debate"), Push ("Group assignment"), Pop. After Pop, the stack has ["CBE notes", "Math revision", "Debate"]. Undoing 3 actions (equivalent to 3 Pops) removes "Debate", "Math revision", and "CBE notes", leaving the stack empty.

ADVENCED THINKING

Q7: **How does a stack enable this retracing process?**

In RwandAir booking, a stack enables retracing by storing each step of the form as it’s filled (pushed). Popping removes the most recent step, allowing the passenger to backtrack step-by-step in LIFO order.

Q8**: Show how a stack algorithm reverses the proverb.**

To reverse "Umwana ni umutware", push each word: Push("Umwana"), Push("ni"), Push("umutware"). Then pop them: Pop("umutware"), Pop("ni"), Pop("Umwana"), resulting in "umutware ni Umwana".

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

A stack suits the student's deep search in Kigali Public Library better than a queue because it follows LIFO, allowing the student to backtrack to the most recently explored shelf, which is more natural for exploring a single path deeply.

Q10**: Suggest a feature using stacks for transaction navigation.**

A feature could be a "Transaction Timeline" where each transaction in the BK Mobile app is pushed onto a stack. Users can pop to revisit or undo recent transactions, with an option to save a snapshot of the stack for later review.

QUEUE

MEANING OF QUEUE: Is data structure that follows the FIFO(First in, First out) principle, where the first element added is the first to be Basics

removed, where the one who arrives first is served first.

A BASIC

Q1**: How does this show FIFO behavior?**

At a Kigali restaurant, customers are served in the order they arrive (enqueue), and the first to arrive is the first served (dequeue), demonstrating FIFO (First In, First Out) behavior.

Q2**: Why is this like a dequeue operation?**

In a YouTube playlist, the next video plays automatically after the current one ends, similar to a dequeue operation where the front item is removed and processed first.

B. Application*

Q3**: How is this a real-life queue?**

At RRA offices, people waiting to pay taxes form a line where each person is served in arrival order, mirroring a real-life queue where service follows a first-come, first-served basis.

Q4: **How do queues improve customer service?**

In MTN/Airtel service centers, SIM replacement requests are processed in order, ensuring fairness and reducing wait time, which improves customer satisfaction and service efficiency.

C. Logical

Q5: **Who is at the front now?**

In Equity Bank, after Enqueue("Alice"), Enqueue("Eric"), Enqueue("Chantal"), Dequeue (), the front is now "Eric" (Alice was removed).

Q6**. Explain how a queue ensures fairness?.**

RSSB pension applications handled by arrival order use a queue to ensure fairness, as each application is processed FIFO, preventing any single request from being unfairly delayed.

D. Advanced Thinking*.

Q7 Explain how each maps to real Rwandan life?.

- Linear queue = people at a wedding buffet, lining up in order.
- Circular queue = buses looping at Nyabugogo, serving passengers cyclically.
- Dequeue = boarding a bus from front/rear, exiting in the order of entry.

Q8**. How can queue model this process?**

At a Kigali restaurant, customers order food and are called when ready. A queue can model this by enqueuing orders and dequeuing them as food is prepared, ensuring orderly service.

Q9.**Why is this priority queue, not a normal queue?.**

At CHUK hospital, emergencies jump the line, indicating a priority queue where urgent cases are dequeued ahead of others based on severity, unlike a normal FIFO queue.

Q10**. How would queues faierly match drivers and students?.**

In a moto/e-bike taxi app, riders wait for passengers. A queue can fairly match them by enqueuing drivers and students separately, dequeuing pairs based on proximity and wait time to ensure equitable service.