

DATA STRUCTURE EXERCISE – Number2

Part 1 – STACK

A. Basics

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

Answer: In the MTN MOMO app, the last step you performed like the last payment detail you filled become the first one to be removed/come out when you press back. This is the Stack statement which says Last in First Out.

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

Answer: Pop means removing the recent step or value from stack. So, when you press back in app it always undoes the last action you did first, not the one you start on. Just like POP the last item on the stack

2. Application

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

Answer: Stack allows to PUSH the element into the stack, the first to be pushed be the last to be out means when the new transaction is added to the stack it become the first and easy to correct if mistake is made

Q4: How can stacks ensure forms are correctly balanced?

Answer: Stack guaranties balance by making Last opened be First closed

3. Logical

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

Answer: the top of the stack: “Group assignment”

Q6: Which answers remain in the stack after undoing?

Answer: Empty/Nothing will remain

4. Advanced Thinking

Q7: How does a stack enable this retracing process?

Answer: Stack use LIFO (Last In First Out) means each step you make is pushed into the Stack, when a Passenger press back the last step he/she make be the first one to be removed.

Q8: Show how a stack algorithm reverses the proverb.

Answer: push("Umwana"), push("ni"), push("Umutware")

POP every word: pop("Umutware"), pop("ni"), pop("Umwana")

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

Answer: because stack retakes steps backwards (undo, back navigation) while Queue follows FIFO (First in First Out) order which works for fair scheduling not for going back. that's why Stack is natural fit here.

Q10. Suggest a feature using stacks for transaction navigation.

Answer: Push: when you open new transaction, you push it no the stack

Pop: when you press back to the previous transaction, you remove the last

Transaction from Stack step by step like undo features

PART II QUEUE

1. Basics

Q1. How does this show FIFO behavior?

Answer: FIFO means First in First Out. In a restaurant the first customer to arrive be the first one to be served and to leave first.

Q2. Why is this like a dequeuer operation?

Answer: Dequeueer removes the front item from the stack. When the first song is removed from the Queue the next one automatically become the first in the queue.

2. Application

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

Answer: Everyone joins the stack at rear(enqueueer) and the services start at the front

Q4. How do queues improve customer service?

Answer: Queue provides order, reduce waiting, ensures first come, first served which makes things fair for everyone, organized for the host and customers

3. Logical

Q5. Who is at the front now?

Answer: Front now: "Eric"

Q6. Explain how a queue ensures fairness.

Answer: Queue follows first in first served, no one can skip others you wait for your turn and be served without skipping others.

4. Advanced Thinking

Q7. Explain how each maps to real Rwandan life

Answer:

- Linear Queue: people at the wedding they follow the line as they reach on once their served they never go back on the line
- Circular Queue: At bus station Nyabugogo when the bus leaves the station it cycles and come back to the station for another round.
- Dequan (Double end queue): boarding bus at front/rear shows how entry and exit are possible at both ends

Q8 How can queues model this process?

Answer: At Kigali restaurant, when customer comes and order they follow the first to order be the first to be called when the food is ready and to be served.

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

Answer: At CHUK Hospital, they follow what called "Priority Queue" means the critical patients jumps ahead of others to ensure more more security and life for the one mostly in need.

Q10. How would queue fairly match drivers and students?

Answer: when drivers are waiting for passengers, first available driver get the first passenger
It becomes fair for the one who was waiting for long time.

