UNIVERSITY OF RWANDA

BIT- EXERCISE OF DATA STRUCTURE

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BIT –Data structure Exercise –number 2

STACK

1. How does MTN MoMo app show the LIFO nature of stacks, when you fill payment details step-by-step, pressing back removes the last step?

It show the LIFO nature of stack where, the last step when you fill payment in MTN MoMo say, PIN confirmation. Is the first one removed when you press “back” button (0).

2. Why in UR canvas, when you navigate course modules, pressing back undoes the last step, is similar to popping from a stack?

Is because when you go back from one module step, you remove the most recent navigation step, the top of the stack.

B. Application

3. How could a stack enable the undo function when correcting mistakes in BK Mobile Banking?

Every transaction is pushed or added to a stack, if you make a mistake, the app pops the most recent transaction then undoing it. The old ones remain untouched.

4. How can stacks ensure forms are correctly balanced?

When filling fields like”() {} []”, each opening is pushed, when a closing one comes, it must match the top of the stack.

If all are matched and the stack ends empty, the form is correctly balanced.

C. Logical

5. Which task is next (top of stack)?

- Push “CBE notes” [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”.

6. Which answers remain in the stack after undoing?

If a student undoes 3 recent actions, pops 3

The last 3 answers are removed, leaving only the earlier answers in the stack, the remaining ones are the ones entered before the last three.

D. Advanced thinking

7. How does stack enable retracing in Rwanda Air booking?

Each step is pushed, when the passenger presses back. The app pops the last step by tracing one-by-one.

8. Show how a stack algorithm reverse the proverb.

- Push [Umwana, ni, umutware]
- Pop umutware ni umwana

The reversed word is Umutware ni umwana.

9. Why does a stack suit the case of searching shelves in Kigali public library better than a queue?

DFS using stack because goes deep into shelves before backtracking, a stack naturally supports this by keeping track deeply of most recent unexplored path, while a queue would search breadth-first, not deep.

10. Suggest a feature in BK app using stacks for transaction navigation.

A transaction navigation feature where each moment is pushed. You can press back to pop and return to the last viewed transaction.

PART II – QUEUE

Basics

How does a restaurant in Kigali show FIFO behavour?

The first customer in line is served first, others wait their turn. Then who served first, finish first and go first. Just like First In, First Out.

2. Why YouTube playlist is a real-life queue?

Is because the next video is automatically played and removed, while the rest shift forward.

3. How at RRA offices is real-life queue?

At RRA offices, people arrive and enqueuer at the back, while the offer come serves them dequeuer in order-fair, first-come-first-served.

4. How do service centers use queue management?

SIM replacements are processed in order of arrival, a ticketing system ensures no one jumps the line.

C. LOGICAL

5. Equity Bank operations:

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 does queue ensure fairness at RSSB?

By handling applications in arrival order, nobody is skipped. Oldest request is processed

first.

D. Advanced Thinking

Q7: Queue types in Rwanda:

Linear queue people at buffet, line ends when last is served.

Circular queue Nyabugogo buses rotate routes, after reaching last stop they return to start.

Dequeue boarding buses from front or back door (insert/remove both ends).

Q8: Restaurant food orders:

Each order is Enqueued when taken. When the kitchen finishes, the order is Dequeued

Q9: Why is CHUK triage a priority queue?

Emergencies are not served by arrival order but by urgency (priority). Normal queues don't allow skipping.

Q10: How would queues fairly match drivers and students?

Students request rides enqueue. Drivers also wait enqueue. The app dequeues the front of both queues to fairly