BIT – Data Structure Exercise – Number 2

Part I – STACK

A

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

In MTN MoMo, the last detail entered is undone first when pressing Back. This is Last-In, First-Out (LIFO).

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

In UR Canvas, Back removes the most recent module visited. This is like Pop removing the top element of a stack.

B

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

Every action is pushed onto the stack. Undo pops the last action, restoring the previous state.

4. Q4: How can stacks ensure forms are correctly balanced?

Push opening brackets onto the stack. For each closing bracket, pop and check for a match. If the stack is empty at the end, the form is balanced.

C. Logical

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

After Push/Pop operations, the top task is 'Group assignment.'

6. Q6: Which answers remain in the stack after undoing?

Undoing 3 actions pops the last 3 answers, leaving only the earlier ones.

D. Advanced Thinking

7. Q7: How does a stack enable this retracing process?

Each booking step is pushed. Going back pops steps one by one, retracing in reverse.

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

Push: [Umwana, ni, umutware]. Pop gives 'umutware ni Umwana.'

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

DFS uses a stack to go deep then backtrack, which suits library search better than BFS with a queue.

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

Each transaction screen is pushed. Using Back pops screens to revisit history step by step.

Part II – QUEUE

A. Basics

11. Q1: How does this show FIFO behavior?

At a restaurant, the first customer to arrive is served first. This is FIFO.

12. Q2: Why is this like a dequeue operation?

In YouTube playlists, the first video plays first and is removed. Same as Dequeue from front.

B. Application

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

At RRA, each person Enqueues at the rear and is served from the front.

14. Q4: How do queues improve customer service?

At MTN/Airtel centers, queues ensure fairness and reduce conflicts.

C. Logical

15. Q5: Who is at the front now?

After Enqueue/Dequeue sequence, 'Eric' is at the front.

16. Q6: Explain how a queue ensures fairness?

In RSSB applications, first submitted = first served, ensuring fairness and transparency.

D. Advanced Thinking

17. Q7: Explain how each maps to Rwandan life.

Linear queue → wedding buffet.
Circular queue → buses looping Nyabugogo.
Deque → boarding a bus from either side.

18. Q8: How can queues model restaurant orders?

Customers place orders (Enqueue). Kitchen processes in order. Ready meals are Dequeued.

19. Q9: Why is this a priority queue?

At CHUK hospital, emergencies are treated first regardless of arrival time.

20. Q10: How would queues fairly match drivers and students?

Requests are Enqueued in order. Drivers Dequeue the next request, ensuring fairness.