UNIVERSITY OF RWANDA

COLLEGE OF BUSINESS AND ECONOMICS

BUSINESS INFORMATION&TECHNOLOGY

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EXERCICES 1 OF DATA STRUCTURE AND ALIGORITHMS

NUMBER	NAMES	REG NUMBER	SUBJECT
1	UWURUKUNDO SENGA AIME SABIN	224009307	DATA STRUCTURE AND ALGORITHMS

STACK and QUEUE Concepts in Real-Life Applications

Part I – STACK

A. Basics

Q1: How does MTN MoMo 'Back' button show LIFO?
In the MoMo app, each payment step you enter is placed on top of the previous one. When you press the Back button, the last thing you entered is removed first. This shows the Last In, First Out (LIFO) nature of stacks.

Q2: Why is UR Canvas 'Back' like popping?
When you open course pages in Canvas, each new page is added on top. Pressing back removes the most recent page. This is the same as Pop() in a stack.

B. Application

Q3: Undo in BK Mobile Banking
Each action, like typing digits, is pushed onto a stack. When you press undo, the last action is popped off, allowing correction of mistakes.

Q4: Balanced Parentheses in Irembo Forms
When you open a section, it is pushed; when you close it, it is popped. If everything matches correctly, the stack becomes empty. This ensures the form is correctly balanced.

C. Logical

Q5: Student's Task Stack
Push("CBE notes"), Push("Math revision"), Push("Debate"), Pop(), Push("Group assignment"). Final stack: Group assignment (top), Math revision, CBE notes. The next task is Group assignment.

Q6: Undo in ICT Exam
Undoing 3 recent actions pops the last 3. The earlier answers remain in the stack.

D. Advanced Thinking

Q7: RwandAir Booking Backtracking
Booking steps are pushed one by one. When going back, steps are popped in reverse order. This allows retracing.

Q8: Reversing the proverb 'Umwana ni umutware'
Push: [Umwana, ni, umutware]. Pop → umutware, ni, Umwana. Reversed: 'umutware ni Umwana'.

Q9: Why Stack for DFS in Library?
DFS goes deep first. A stack remembers the last shelf entered, so you can backtrack properly. This is why stack fits DFS better than a queue.

Q10: BK Mobile Navigation
Each transaction detail is pushed. Pressing back pops it, returning to the previous screen. A feature could allow users to jump back through their last 3 viewed transactions.

Part II – QUEUE

A. Basics

Q1: Restaurant Serving (FIFO)
Customers join the line in order and the first to arrive is the first to be served. This shows First In, First Out (FIFO).

Q2: YouTube Playlist (Dequeue)
The next video plays first, just like Dequeue() removes the front item of a queue.

B. Application

Q3: RRA Tax Line
People join at the back (enqueue) and are served from the front (dequeue). This is a real-life queue.

Q4: MTN/Airtel Customer Service
Requests are handled in order of arrival. This ensures fairness and efficiency.

C. Logical

Q5: Equity Bank Queue
Enqueue(Alice), Enqueue(Eric), Enqueue(Chantal), Dequeue(), Enqueue(Jean). Final queue: [Eric, Chantal, Jean]. Eric is at the front.

Q6: RSSB Fairness
Applications are served in order of arrival. Queues ensure fairness and transparency.

D. Advanced Thinking

Q7: Queue Types in Rwandan Life
- Linear queue: People at a wedding buffet.
- Circular queue: Buses looping at Nyabugogo.
- Deque: Boarding a bus from both front and rear doors.

Q8: Restaurant Orders
Orders are enqueued as customers place them. They are dequeued in the same sequence when ready.

Q9: CHUK Emergency Patients
Emergencies jump the line. This is a priority queue, not a normal queue.

Q10: Moto/E-bike Taxi App
Drivers wait in a queue. The driver at the front is matched first with a passenger. This ensures fairness.