Quiz

1 Quiz

a) Is the following execution linearizable?

```
A
r.read(1)
```
```
B
r.write(1)  r.read(1)
```
```
C
r.write(2)
```

b) Is the following property equivalent to saying that object $x$ is wait-free?

For every infinite history $H$ of $x$, every thread that takes an infinite number of steps in $H$
completes an infinite number of method calls.

c) If the size of a transaction is large, is HTM preferred or STM? Why?

Advanced

2 Sequential vs. Quiescent

Give an example of an execution that is quiescently consistent but not sequentially consistent,
and another that is sequentially consistent but not quiescently consistent.

*Hint*: A single read-write register and two threads suffice.

3 Linearizability

The following is an implementation of a queue in Java. The queue is implemented as a maximum-sized array
and the entries are initialized to null. Give an example execution which shows that
the implementation is not linearizable.
class IQueue<T> {
    AtomicInteger head = new AtomicInteger(0);
    AtomicInteger tail = new AtomicInteger(0);
    T[] items = (T[]) new Object[Integer.MAX_VALUE];

    public void enqueue(T x) {
        int slot;
        do {
            slot = head.get();
        } while (!head.compareAndSet(slot, slot + 1));
        items[slot] = x;
    }

    public T dequeue() throws EmptyException {
        T value;
        int slot;
        do {
            slot = tail.get();
            value = items[slot];
            if (value == null)
                throw new EmptyException();
        } while (!tail.compareAndSet(slot, slot + 1));
        return value;
    }
}