2. (a) A 1-bit full-adder performs addition on two significant bits and a previous carry bit.

   i. State whether a 1-bit full adder is an example of a combinatorial or sequential logic circuit. Justify your answer. [4]

   ii. Design the logic circuit for a 1-bit full adder. [8]

   (b) D-type flip-flops are used in the design of many common sequential logic circuits.

   i. Draw and explain the truth table for a D-type flip-flop. [3]

   ii. Design an N-bit register using D-type flip-flops. Your design should be capable of storing N bits in response to a single clock cycle. State any assumptions. [7]

   (c) Explain the operation of a decoder. Your answer should include the truth table for an active-high 2-to-4 line decoder. [3]