2. (a) Explain the difference between combinatorial logic and sequential logic. [3]

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

      i. Draw the truth table for a 1-bit full-adder. [4]

      ii. Design a logic circuit that implements the truth table of a 1-bit full-adder. [5]

   (c) 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. [5]

      iii. Design an N-bit binary counter using D-type flip-flops. Your design should give an explanation of how the circuit operates. State any assumptions. [5]