2. (a) Distinguish between combinatorial and sequential logic. [3]

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

      i. Show the truth table and logic circuit for a 1-bit half adder. [4]

      ii. Show how an N-bit full adder can be designed based on N 1-bit full-adders. Your answer should include the logic circuit for a 1-bit full adder. [8]

   (c) D-type flip-flops are commonly used in circuit design.

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

      ii. Show how D-type flip flops can be used in the design of an N-bit counter. [7]