Digital Electronics

(a) What is a minimum sum-of-products? [3 marks]

(b) A full adder has data inputs \((A_0, B_0)\) and a carry input \((C_0)\). The sum \((S_0)\) and carry \((C_1)\) are output. What are the minimum sum-of-products equations for \(S_0\) and \(C_1\)? [6 marks]

(c) How could the gate count for the implementation of output \(S_0\) be reduced using XOR gates? [2 marks]

(d) For a 3-bit full adder (i.e. one which has three A inputs \((A_0, A_1, A_2)\), three B inputs \((B_0, B_1, B_2)\) and three sum outputs \((S_0, S_1, S_2)\)), the final carry output is \(C_3\). What is the sum-of-products equation for \(C_3\) in terms of the A and B inputs? [6 marks]

(e) If we were to implement an 8-bit full adder, why would we look for a multi-level logic implementation for the carry output \((C_8)\)? [3 marks]