# 2005 Paper 10 Question 1

## 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]