

2000 Paper 2 Question 2

Digital Electronics

What is the maximum number of terms there can be in a minimal sum of products form of a function of n boolean variables? [2 marks]

Consider a two-bit multiplier with inputs x_1, x_0, y_1, y_0 and outputs z_3, z_2, z_1, z_0 such that

$$Z = Y \times X$$

where Z, Y, X are the positive integers represented by $z_3z_2z_1z_0$, y_1y_0 and x_1x_0 using the obvious representation.

Find a minimal sum of products expression for each of z_3, z_2, z_1 and z_0 . [10 marks]

Comment on the complexity of building an eight-bit multiplier using a minimal sum of products form. [3 marks]

Describe another way of building an eight-bit multiplier. [5 marks]