

2002 Paper 11 Question 1

Digital Electronics

- (a) Find a minimal sum of products form for each of the following partially specified boolean functions. Each partially specified function, g_i , is specified by a function f_i which is true when g_i must be true and d_i which is true when g_i may be true or false (that is, d_i represents the “don’t cares”).

(i) $f_1 = yx\bar{w} + xyz + \bar{y}\bar{x}\bar{z}w + xwz$

$$d_1 = \bar{x}z \quad [4 \text{ marks}]$$

(ii) $f_2 = y\bar{w}\bar{z} + \bar{w}\bar{x}\bar{z} + \bar{y}\bar{w}\bar{z}$

$$d_2 = \bar{x}w\bar{z} \quad [4 \text{ marks}]$$

- (b) What is the maximum number of product terms in a minimal sum of products form of a function of n boolean variables? [2 marks]

- (c) How do “don’t cares” arise in practice and how may they be exploited? Are there any pitfalls in using them? Illustrate your answer with examples. [10 marks]