

COMSM0302 - WEEK 4 SOLUTIONS

JAMES MARSHALL
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1. SOLUTION 2 - NUMBER OF POSSIBLE n -BIT BOOLEAN FUNCTIONS

An n -bit boolean function has 2^n instances. Each unique boolean function assigns a class, 0 or 1, to each of these instances. Hence, the number of possible boolean functions is 2, raised to the power of the number of instances, i.e.

$$2^{2^n}.$$

Hence the probability of finding the 11-multiplexer function by uniformly randomly generating an 11-bit function is 1 in 2^{2048} , or 3.23×10^{616} , i.e. vanishingly small.

2. SOLUTION 3 - SUFFICIENT SETS FOR THE MULTIPLEXER

The minimum sufficient subsets of F to solve the multiplexer are $\{IF\}$, $\{\vee, \neg\}$ and $\{\wedge, \neg\}$.