

### ICS 2021 Problem Sheet #7

**Problem 7.1:** *quine-mccluskey algorithm*

(2+4+3+1 = 10 points)

Consider integer numbers in the range  $0 \dots 63$  that can be represented using six bits. The boolean function  $F(X_5, X_4, X_3, X_2, X_1, X_0)$  is true when the number  $(X_5X_4X_3X_2X_1X_0)_2$  is a Fibonacci number and false otherwise.

- a) Provide a boolean expression in DNF defining the function  $F$ . What is the cost of the DNF expression?
- b) Calculate the prime implicants of  $F$ .
- c) Construct the prime implicant chart and identify the essential prime implicants. What is a minimal set of prime implicants covering the function  $F$ ?
- d) Write out a minimal boolean expression defining  $F$  using mathematical logic notation. What is the cost of the minimal boolean expression?

For calculating the cost of a boolean expression, we only consider logical  $\wedge$  and  $\vee$  operations.