2025《计算机系统 I》课程小测 1

姓名：_____ 学号：_____ 判卷人：_____ 分数：_____/50

1、Calculate the gate input cost for the **original** F and simplify it. (8 pts)

$$F = A(B + \bar{C}) + \bar{A}(\bar{B} + C) + BCD + \bar{B}\bar{C}D$$

2、(12%) For the following Boolean functions F together with the don't-care conditions d, first draw a K-map, then obtain an optimized SOP and POS expression, separately.

$$F(A,B,C,D) = \sum m(1,3,7,11,15) + \sum d(0,2,5)$$

a) (4%) Draw the K - map.

b) (4%) List all the prime implicants and the essential prime implicants;

c) (2%) Obtain the SOP optimization.

d) (2%) Obtain the POS optimization.

3、采用一个 4 位全加器设计一个 4 位递增/递减器。当输入 S = 0 时，电路是一个递增器；当 S = 1 时，电路是一个递减器。（10 分）

4、(20%) 设计一个可控计数器。当控制输入$C=1$时，计数顺序为$000 \rightarrow 100 \rightarrow 110 \rightarrow 111 \rightarrow 011 \rightarrow 000$；当$C=0$时，计数顺序为$000 \rightarrow 100 \rightarrow 110 \rightarrow 010 \rightarrow 011 \rightarrow 000$。请写出状态表，状态方程和输出方程，并画出电路图。