COS126 and 128: General Computer Science	Spring 1996

More Sample Exam Questions

May 14, 1996

Problem 1 Write the Boolean equation, using AND, OR, NOT, for the function f over variables x, y, and z, whose table of values (i.e. truth table) is shown below. (Note that the truth table is split just to save space.)

```
  x  y  z  | f(x,y,z)          x  y  z  | f(x,y,z)
-----------|----------       -----------|----------
  0  0  0  |    0              1  0  0  |    1
  0  0  1  |    1              1  0  1  |    0
  0  1  0  |    1              1  1  0  |    0
  0  1  1  |    0              1  1  1  |    0
```

Problem 2 Show how to implement the 4-bit linear feedback shift register, `lfsr`, given below, using AND, OR and NOT logic gates and four clocked master-slave flip-flops. Each master-slave flip-flop should hold one value, denoted `lfsr[i]`, $0 \leq i \leq 3$. The C-code fragment given below specifies the update for each flip-flop value on each clock cycle (i.e. each time the clock goes to 0 edge).

```
temp = lfsr[1] ^ lfsr[3];
for (i=3; i > 0; i--)
    lfsr[i] = lfsr[i-1];
lfsr[0] = temp;
```