Homework 4: EE 252 Digital Electronics
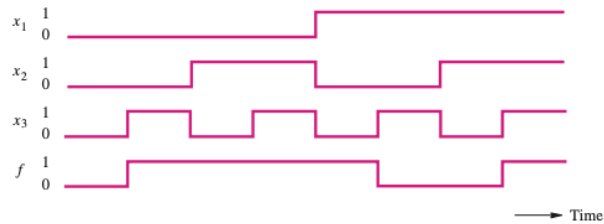
1. For the timing diagram in Figure P2.4, synthesize the function $f(x_1, x_2, x_3)$ in the simplest product-of-sums form.

Figure P2.4 A timing diagram representing a logic function.

2. Design a circuit with output f and inputs x_1, x_0, y_1, and y_0. Let $X = x_1x_0$ and $Y = y_1y_0$ represent two 2-digit binary numbers. The output f should be 1 if the numbers represented by X and Y are equal. Otherwise, f should be 0.

      (a) Show the truth table for f.
      (b) Synthesize the simplest possible product-of-sums expression for f.

3. Implement the function in Figure 2.31 using only NAND gates.

x_1	x_2	x_3	f
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Figure 2.31 Truth table for the three-way light control.

4. Implement the function in Figure 2.31 using only NOR gates.