Chapter 6 text book problems 6.4 & 6.10

Chapter 7 text book problems 7.16 a , b and 7.22

6.4 (a) The next state equation of Q_1 can be implemented using the X function generator with the inputs R, S, Q_1, and Q_2. The next state equation of Q_2 can be implemented using the Y function generator with the inputs T, Q_1, and Q_2. The output P can be implemented using the Z function generator with the inputs T (C input) and the X function generator.

(b)
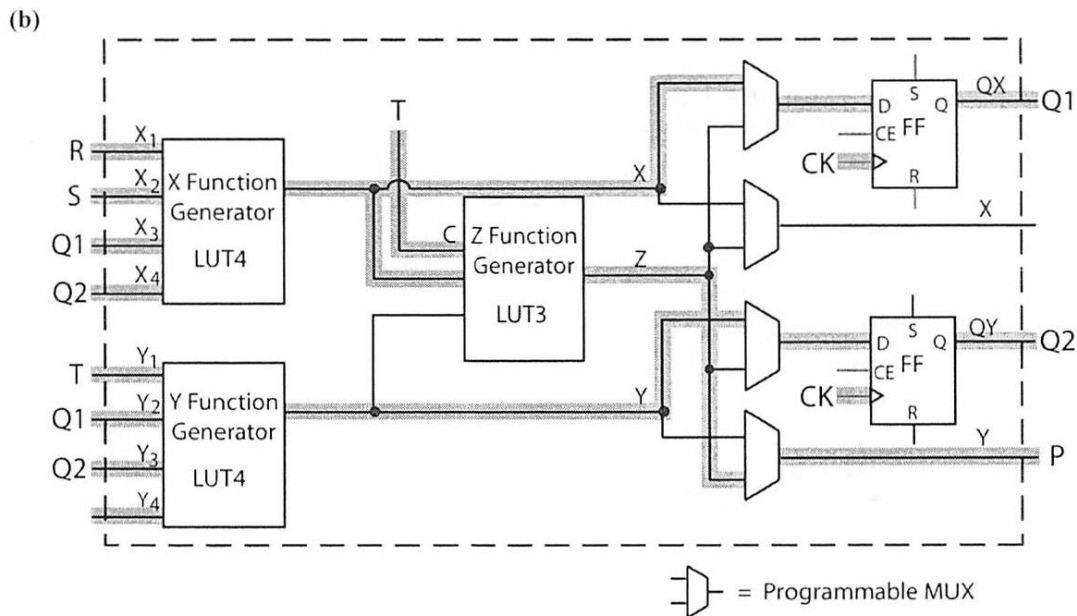
6.10 Expanding F around X_6 results in 4 variable functions which can be realized using one function generator each.

$$F = X_6 (X_1' X_2 X_3 + X_2 X_3' X_4' + X_2 X_3 X_4') + X_6' (X_2' X_3' X_4 + X_2 X_3' X_4' + X_3' X_4 X_5) + X_7$$
$$F = X_6 (F_1) + X_6' (F_2) + X_7$$

For block one: X LUT has inputs X_1, X_2, X_3, and X_4 and realizes $F_1 = X_1' X_2 X_3 + X_2 X_3' X_4' + X_2 X_3 X_4'$.
Y LUT has inputs X_2, X_3, X_4, and X_5 and realizes $F_2 = X_2' X_3' X_4 + X_2 X_3' X_4' + X_3' X_4 X_5$

For block two: X LUT has the outputs of block one's X LUT (F_1) and Y LUT (F_2), X_6, and X_7 as inputs. The X LUT realizes $F = X_6 (F_1) + X_6' (G_1) + X_7$. The Y LUT is unused.

7.16 **(a)** The steps for floating point addition are listed in Section 7.3 of the text.

(b) 1) Make exponents equal.

	F_1: 1.0101	E_1: 1001	($-11/16 \times 2^{-6}$)
	F_2: 0.0101	E_2: 1001	($5/16 \times 2^{-6}$)

2) Add the fractions. F: 1.1010 E: 1001 ($-6/16 \times 2^{-6}$)

3) Normalize the fraction. F: 1.0100 E: 1000 ($-12/16 \times 2^{-7}$)

4) Check for exponent overflow. No overflow.

In summary, the steps required to carry out floating-point addition are as follows:

1. Compare exponents. If the exponents are not equal, shift the fraction with the smaller exponent right and add 1 to its exponent; repeat until the exponents are equal.
2. Add the fractions (significands).
3. If the result is 0, set the exponent to the appropriate representation for 0 and exit.
4. If fraction overflow occurs, shift right and add 1 to the exponent to correct the overflow.
5. If the fraction is unnormalized, shift left and subtract 1 from the exponent until the fraction is normalized.
6. Check for exponent overflow. Set overflow indicator, if necessary.
7. Round to the appropriate number of bits. Is it still normalized? If not, go back to step 4.

7.22 $2^{40} + (-2^{40} + 1) = 2^{40} + -2^{40} = 0$

$(2^{40} + -2^{40}) + 1 = 0 + 1 = 1$