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Assignment # 3

Question (2)

Inputs : ω

Outputs : z

States : Q_1 & Q_2

FF on the top : D_1

FF on the bottom : D_2

Inputs to FF

(1) $D_1 = \omega \cdot (\bar{Q}_1 + Q_2)$

(2) $D_2 = Q_2 \oplus (\bar{\omega} \cdot Q_2 + \omega \cdot \bar{Q}_2 \cdot Q_1)$

$= \bar{Q}_2 (\bar{\omega} \cdot Q_2 + \omega \cdot \bar{Q}_2 \cdot Q_1) + \overline{(\bar{\omega} \cdot Q_2 + \omega \cdot \bar{Q}_2 \cdot Q_1)} \cdot Q_2$

$= Q_2 \bar{Q}_2 \bar{\omega} + \bar{Q}_2 \bar{Q}_2 \cdot \omega \cdot Q_1 + (\overline{Q_2 \bar{\omega}}) \cdot (\overline{\bar{Q}_2 \omega Q_1}) \cdot Q_2$

$D_2 = \omega \cdot Q_1 \cdot \bar{Q}_2 + \omega \cdot Q_2 + \omega \cdot Q_2 \bar{Q}_1$

Final Output

$z = Q_1 \cdot Q_2$

$\hat{Q}_1 = \omega \cdot (\bar{Q}_1 + Q_2)$

$\hat{Q}_2 = \omega \cdot Q_1 \bar{Q}_2 + \omega \cdot Q_2 + \omega \cdot Q_2 \cdot \bar{Q}_1$

State transition table.

	Clr'	Pr'	ω	Q_1	Q_2	$\hat{Q}_1$	$\hat{Q}_2$	z
(1)	0	1	0	0	0	0	0	0
(2)	1	1	0	0	1	0	0	0
(3)	1	1	0	1	0	0	0	0
(4)	1	1	0	1	1	0	0	1
(5)	1	1	1	0	0	1	0	0
(6)	1	1	1	0	1	1	1	0
(7)	1	1	1	1	0	0	1	0
(8)	1	1	1	1	1	1	1	1

Question 1

(1) a) Done on logic works

b) $T_{Pd} = 1 \quad T_{su} = 1 \quad T_{C1} = T_{mux} + T_{DFF}$

$= 4 + 1$

$T_{C1} = 5$

$$f_{max} = \frac{1}{T_{Pd} + T_{su} + T_{C1}}$$

$$= \frac{1}{1 + 1 + 5}$$

$$= \frac{1}{7_{ns}}$$

$f_{max} = 142.86\ MHz$

c) First time analysis ran at max frequency
second time analysis ran at shorter time, ∴ at a frequency higher than max frequency
There is a big difference in the two diagrams, which show that for a bigger frequency, the circuit fails.