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CS220 Computer Architecture

Practical 8 Report

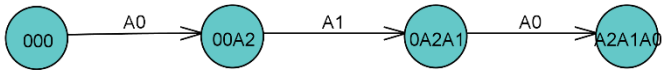
Circuit description

A synchronous sequential circuit as a 3–bit left shift register.

- *Using the J–K flip–flop module.*
- *Displaying the value of its contents in decimal.*

Design Details

1. *Construct a transition diagram and table.*



Q_2^n	Q_1^n	Q_0^n	Input/X	Q_2^{n+1}	Q_1^{n+1}	Q_0^{n+1}
0	0	0	A2	0	0	A2
0	0	A2	A1	0	A2	A1
0	A2	A1	A0	A2	A1	A0

2. *Derive Boolean expressions.*

$$Q_0^{n+1} = X = X\left(Q_0^n + \overline{Q_0^n}\right) = X\overline{Q_0^n} + XQ_0^n$$

$$\begin{cases} J_0 = X \\ K_0 = \overline{X} \end{cases}$$

$$Q_1^{n+1} = Q_0 = Q_0\left(Q_1^n + \overline{Q_1^n}\right) = Q_0\overline{Q_1^n} + Q_0Q_1^n$$

$$\begin{cases} J_1 = Q_0 \\ K_1 = \overline{Q_0} \end{cases}$$

$$Q_2^{n+1} = Q_1 = Q_1\left(Q_2^n + \overline{Q_2^n}\right) = Q_1\overline{Q_2^n} + Q_1Q_2^n$$

$$\begin{cases} J_2 = Q_1 \\ K_2 = \overline{Q_1} \end{cases}$$

Circuit schematic