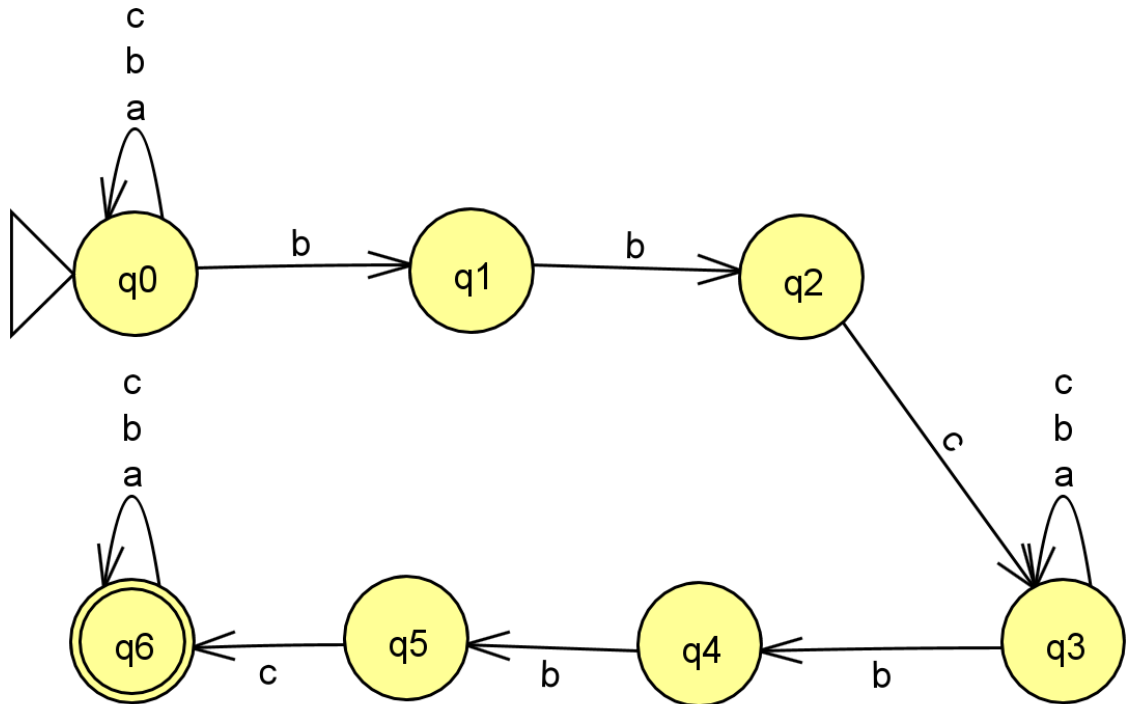


**Page 108, Q 11:**

- a)  $\varepsilon \in L1$ , when  $n, m, x = 0 \rightarrow \{((ab)^0 \cdot c)^0 \cdot a^0\} = \varepsilon$
- b)  $abc \in L2$ , when  $n = 1 \rightarrow \{a \cdot b^1 \cdot c \cdot b^0\} = abc$
- c)  $R(L2) = \{b^{n-1} \cdot c \cdot b^n \cdot a \mid n > 0\}$
- d)  $R(L3) = \{w \mid w \text{ contains } bc\}$  and  $L4 = \{w \mid w \text{ contains } bbc\}$   $R(L3) \cap L4 = R(L3)$  because  $R(L3) \supset L4$
- e)



- f)  $L1$
- g)
- h)  $L1 \cdot L2 = \{((ab)^n \cdot c)^m \cdot a^{x+1} \cdot b^k \cdot c \cdot b^{k-1} \mid n, k > 0, m, x \geq 0\}$
- i)  $L3 = \{W1 \cdot cb \cdot W2 \mid W1, W2 \text{ are words from the } abc\{a, b, c\}\},$   
 $L3 \cdot L1 = \{W1 \cdot cb \cdot W2 \cdot ((ab)^n \cdot c)^m \cdot a^x \mid n > 0, m, x \geq 0, W1, W2 \text{ are words from the } abc\{a, b, c\}\}$
- j)

