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Ex. 6.1.1

$P = \{ \{q,P\}, \{0,1\}, \{Z_0, X\}, \delta, q, Z_0, \{P\} \}$

$\delta = $
1. $\delta(q, 0, Z_0) = \{(q, X Z_0)\}$
2. $\delta(q, 0, X) = \{(q, XX)\}$
3. $\delta(q, 1, X) = \{(q, X)\}$
4. $\delta(q, \epsilon, X) = \{(P, \epsilon)\}$
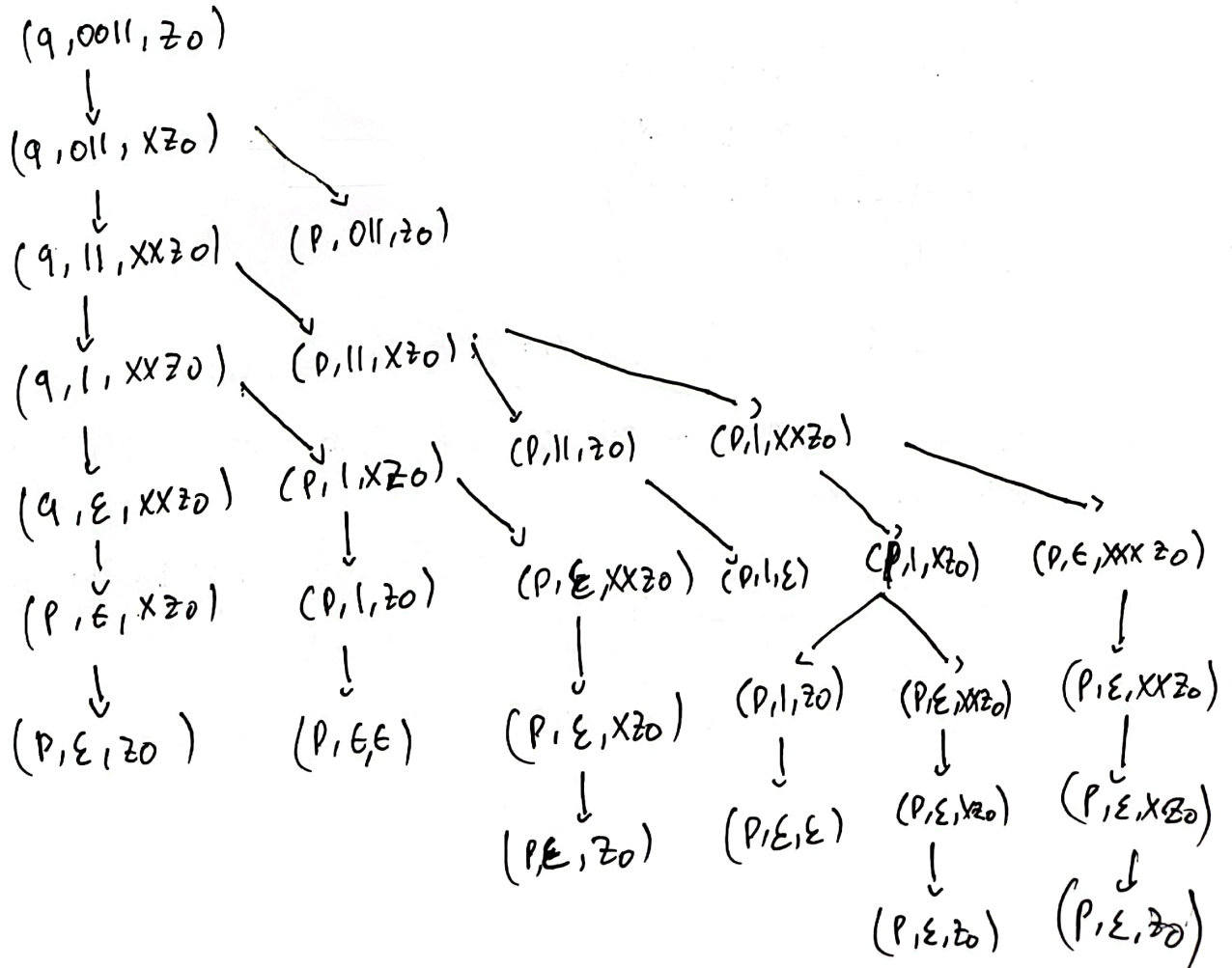5. $\delta(P, \epsilon, X) = \{(P, \epsilon)\}$
6. $\delta(P, 1, X) = \{(P, XX)\}$
7. $\delta(P, 1, Z_0) = \{(P, \epsilon)\}$

a.) 01

$(q, 01, Z_0) \longrightarrow (q, 1, X Z_0) \begin{cases} \longrightarrow (q, \epsilon, X Z_0) \longrightarrow (P, \epsilon, Z_0) \\ \longrightarrow (P, 1, Z_0) \longrightarrow (P, \epsilon, \epsilon) \end{cases}$

b.) 0011

$(q, 0011, Z_0)$

$\downarrow$

$(q, 011, X Z_0)$ $\longrightarrow$ $(P, 011, Z_0)$

$\downarrow$

$(q, 11, XX Z_0)$ $\quad$ $(P, 011, Z_0)$

$\downarrow$

$(q, 1, XX Z_0)$ $\quad$ $(P, 11, X Z_0)$

$\downarrow$

$(q, \epsilon, XX Z_0)$ $\quad$ $(P, 1, X Z_0)$ $\quad$ $(P, 11, Z_0)$ $\quad$ $(P, 1, XX Z_0)$

$\downarrow$

$(P, \epsilon, XX Z_0)$ $\quad$ $(P, 1, Z_0)$ $\quad$ $(P, \epsilon, XX Z_0)$ $\quad$ $(P, 1, \epsilon)$ $\quad$ $(P, 1, X Z_0)$ $\quad$ $(P, \epsilon, XXX Z_0)$

$\downarrow$

(P, ϵ, Z_0) $\quad$ (P, ϵ, ϵ) $\quad$ $(P, \epsilon, X Z_0)$ $\quad$ $(P, 1, Z_0)$ $\quad$ $(P, \epsilon, XX Z_0)$ $\quad$ $(P, \epsilon, XX Z_0)$

$\downarrow$

(P, ϵ, Z_0) $\quad$ (P, ϵ, ϵ) $\quad$ $(P, \epsilon, X Z_0)$ $\quad$ $(P, \epsilon, X Z_0)$

$\downarrow$

(P, ϵ, Z_0) $\quad$ (P, ϵ, Z_0)

c.) 010

$(q, 010, z_0) \longrightarrow (q, 10, xz_0) \longrightarrow (q, 0, xz_0) \longrightarrow (q, \varepsilon, xxz_0)$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \hookrightarrow (p, \varepsilon, xz_0) \longrightarrow (p, \varepsilon, z_0)$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \hookrightarrow (p, 0, z_0)$

$\quad\quad\quad\quad\quad\quad\quad \hookrightarrow (p, 10, z_0) \longrightarrow (p, 0, \varepsilon)$

ex. 6.2.1

a) $\{0^n 1^n \mid n \geq 1\}$.

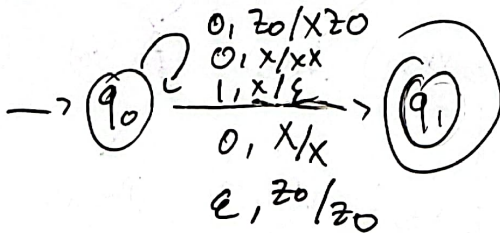Input 1 $\longrightarrow$ Pindah ke state lain
Pop x $\longrightarrow$ jika ketemu input 1
Push x $\longrightarrow$ input 0

$0, z_0/xz_0$

$0, x/xx$
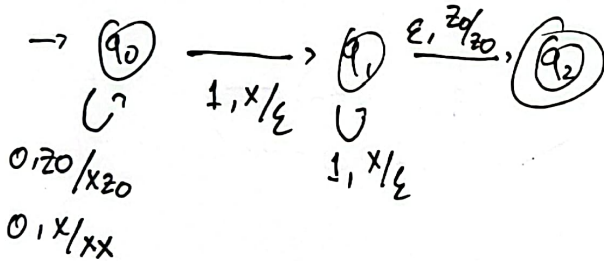
1. $\delta(q, 0, z_0) = \{(q, x)\}$
2. $\delta(q, 0, x) = \{(q, xx)\}$
3. $\delta(q, 1, x) = \{(p, \varepsilon)\}$
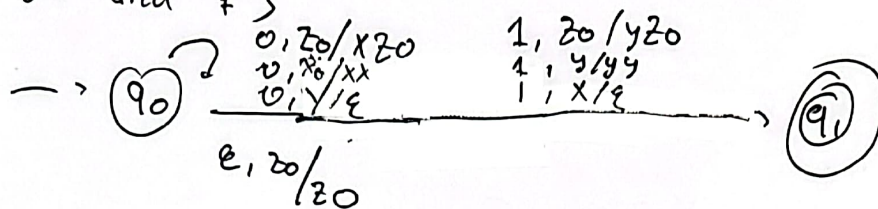4. $\delta(p, 1, x) = \{(p, \varepsilon)\}$

$P = (\{q_0, q_1, q_2\}, \{0, 1\}, \{x, z_0\}, \delta, q_0, z_0, \{q_2\})$

b.) Set of all strings of 0's and 1's such that no prefix has more 1's than 0's

$0, z_0/xz_0$
$0, x/xx$
$1, x/\varepsilon$
$0, x/x$
$\varepsilon, z_0/z_0$

$P = (\{q_0, q_1\}, \{0, 1\}, \{x, z_0\}, \delta, q_0, z_0, \{q_1\})$

c.) Set of all strings of 0's and 1's that has equal 0's and 1's

$$0, Z_0/XZ_0 \qquad 1, Z_0/YZ_0$$
$$0, X_0/XX \qquad 1, Y/YY$$
$$0, Y/\varepsilon \qquad 1, X/\varepsilon$$

$$\varepsilon, Z_0/Z_0$$

$$P = (\{q_0, q_1\}, \{0,1\}, \{x, y, Z_0\}, \delta, q_0, Z_0, \{q_1\})$$

Ex. 6.2.5

$$P = (\{q_0, q_1, q_2, q_3, f\}, \{a, b\}, \{Z_0, A, B\}, \delta, q_0, Z_0, \{f\})$$

$$\delta(q_0, a, Z_0) = (q_1, AAZ_0) \qquad \delta(q_0, b, Z_0) = (q_2, BZ_0) \qquad \delta(q_0, \varepsilon, Z_0) = (f, G)$$
$$\delta(q_1, a, A) = (q_1, AAA) \qquad \delta(q_1, b, A) = (q_1, \varepsilon) \qquad \delta(q_1, \varepsilon, Z_0) = (q_0, Z_0)$$
$$\delta(q_2, a, B) = (q_3, \varepsilon) \qquad \delta(q_2, b, B) = (q_2, BB) \qquad \delta(q_2, \varepsilon, Z_0) = (q_0, Z_0)$$
$$\delta(q_3, \varepsilon, B) = (q_2, \varepsilon) \qquad \delta(q_3, \varepsilon, Z_0) = (q_1, AZ_0)$$

a.) bab

$$(q_0, bab, Z_0) \vdash (q_2, ab, BZ_0) \vdash (q_3, b, Z_0) \vdash (a, b, AZ_0) \vdash (a, \varepsilon, Z_0) \vdash$$
$$(a_0, \varepsilon, Z_0) \vdash (f, \varepsilon, \varepsilon)$$

b.) abb

$$(q_0, abb, Z_0) \vdash (a, bb, AAZ_0) \vdash (a_2, b, AZ_0) \vdash (q_1, \varepsilon, Z_0) \vdash (q_0, \varepsilon, Z_0) \vdash (f, \varepsilon, \varepsilon)$$

c.) $b^7 a^4$

$$(a_0, b^7 a^4, Z_0) \vdash (q_2, b^6 a^4, BZ_0) \vdash (q_2, b^5 a^4, B^2 Z_0) \vdash \ldots \vdash (q_2, a^4, B^7 Z_0)$$
$$\vdash (a_3, a^3, B^6 Z_0) \vdash (a_2, a^2, B^5 Z_0) \vdash (a_3, a^2, B^4 Z_0) \vdash \ldots \vdash (a_3, \varepsilon, Z_0)$$
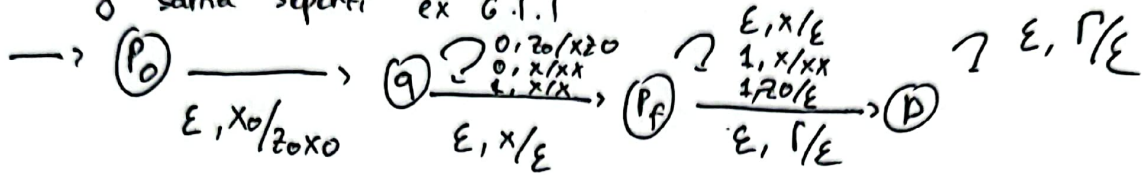$$\vdash (q_1, \varepsilon, AZ_0)$$

isi stack : $A = 0$

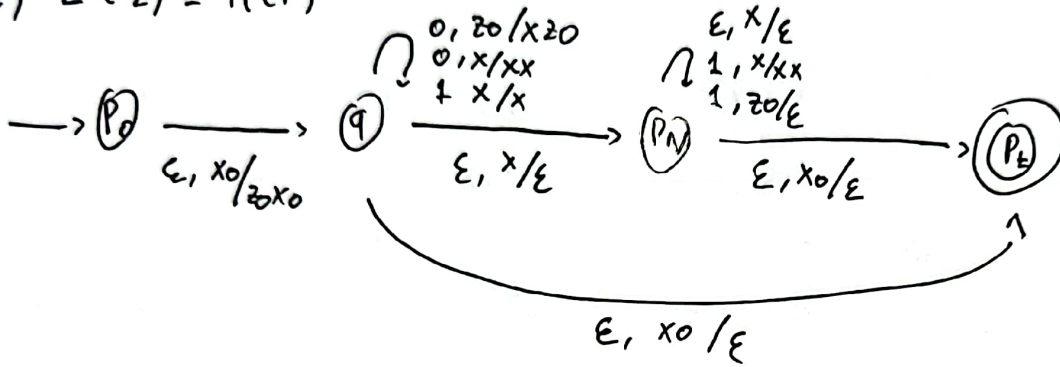d.) $L(P) = x \mid x$ memiliki jumlah b 2x dari jumlah a

EX 6.2.6

a.) $N(P_1) = L(P)$

$P = (\{q, p\}, \{0, 1\}, \{z_0, x\}, \delta, q, z_0, \{p\})$

δ sama seperti ex 6.1.1

$$\longrightarrow (P_0) \xrightarrow{\varepsilon, X_0/z_0X_0} (q) \overset{\curvearrowright}{\underset{\varepsilon, X/X}{\xrightarrow[\varepsilon, X/\varepsilon]{\substack{0, z_0/Xz_0 \\ 0, X/XX}}}} (P_f) \overset{\curvearrowright}{\underset{\varepsilon, \Gamma/\varepsilon}{\xrightarrow[\text{}]{\substack{1, X/XX \\ 1, z_0/\varepsilon}}}} (P) \; \overset{\curvearrowright}{\rightsquigarrow} \varepsilon, \Gamma/\varepsilon$$

b.) $L(P_2) = N(P)$

$$\longrightarrow (P_0) \xrightarrow{\varepsilon, X_0/z_0X_0} (q) \overset{\curvearrowright}{\underset{\varepsilon, X/\varepsilon}{\xrightarrow[\text{}]{\substack{0, z_0/Xz_0 \\ 0, X/XX \\ 1 \; X/X}}}} (P_N) \overset{\curvearrowright}{\underset{\varepsilon, X_0/\varepsilon}{\xrightarrow[\text{}]{\substack{\varepsilon, X/\varepsilon \\ 1, X/XX \\ 1, z_0/\varepsilon}}}} (P_L)$$

$$\varepsilon, x_0/\varepsilon$$

$$P_L = (\{P_0, q, P_N, P_f\}, \{0, 1\}, \{x_0, z_0, x\}, \delta, P_0, x_0, \{P_f\})$$