

$$M = (\{q_0, q_1\}, \{0, 1\}, \{X, z_0\}, \delta, q_0, z_0, \phi)$$

where δ is given by

$$\delta(q_0, 0, z_0) = \{ (q_0, Xz_0) \}$$

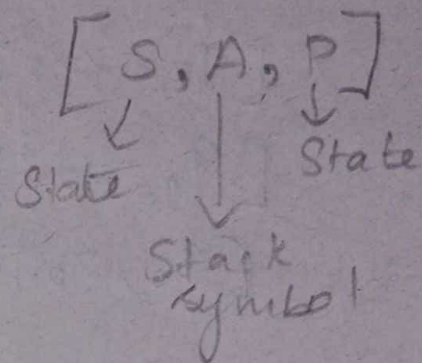
$$\delta(q_0, 0, X) = \{ (q_0, XX) \}$$

$$\delta(q_0, 1, X) = \{ (q_1, \epsilon) \}$$

$$\delta(q_1, 1, X) = \{ (q_1, \epsilon) \}$$

$$\delta(q_1, \epsilon, X) = \{ (q_1, \epsilon) \}$$

$$\delta(q_1, \epsilon, z_0) = \{ (q_1, \epsilon) \}$$



Construct a CFG G generating $N(M)$

Solution:

We find CFG $G = (V, T, P, S)$

$$V = \{ S, [q_0, X, q_0], [q_0, X, q_1], [q_1, X, q_0], [q_1, X, q_1], [q_0, z_0, q_0], [q_0, z_0, q_1], [q_1, z_0, q_0], [q_1, z_0, q_1] \}$$

T = set of inputs (Σ)

$$T = \{0, 1\}$$

P = set of transition

→ 2 stacks

$$1) f(q_0, 0, z_0) = (q_0, \underline{xz_0})$$

add

$$[q_0, z_0, q_0] \rightarrow 0 [q_0, x, q_0] [q_0, z_0, q_0]$$

del

$$[q_0, z_0, q_0] \rightarrow 0 [q_0, x, q_1] [q_1, z_0, q_0]$$

$$[q_0, z_0, q_1] \rightarrow 0 [q_0, x, q_0] [q_0, z_0, q_1]$$

$$[q_0, z_0, q_1] \rightarrow 0 [q_0, x, q_1] [q_1, z_0, q_1]$$

$$2) f(q_0, 0, x) = (q_0, xx)$$

add

$$[q_0, x, q_0] \rightarrow 0 [q_0, x, q_0] [q_0, x, q_0]$$

del

$$[q_0, x, q_0] \rightarrow 0 [q_0, x, q_1] [q_1, x, q_0]$$

$$[q_0, x, q_1] \rightarrow 0 [q_0, x, q_0] [q_0, x, q_1]$$

$$[q_0, x, q_1] \rightarrow 0 [q_0, x, q_1] [q_1, x, q_1]$$

$$3) f(q_0, 1, x) = (q_1, \epsilon)$$

$$[q_0, x, q_1] \rightarrow 1$$

$$4) f(q_0, x, x) = (q_1, \epsilon)$$

$$[q_1, x, q_1] \rightarrow 1$$

$$A) \delta(q_1, \epsilon, x) = (q_1, \epsilon)$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$[q_1, x, q_1] \rightarrow \epsilon$$

$$B) \delta(q_1, \epsilon, z_0) = (q_1, \epsilon)$$

$$[q_1, z_0, q_1] \rightarrow \epsilon$$

$$S \rightarrow [q_0, z_0, q_0]$$

$$S \rightarrow [q_0, z_0, q_1]$$

initial state + initial stack = q_0

State