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HomeWork - 2 , IT-468

Q1 CFG for $L = \{ 0^m 1^n \mid m \neq n, m, n \geq 0 \}$

$S_1 \longrightarrow 0 S_1 1 \mid \varepsilon$

$S \longrightarrow 0 S_1 \mid S_1 1 \mid \varepsilon$

Q2 CFG $G = (\{S\}, \{a, b\}, P, S)$

$S \longrightarrow \varepsilon \mid a S b S \mid b S a S$

$L(G) = \{ w \mid$ number of a is equal to number of b is $w \}$

Q3

(i) $\{ w \mid$ every odd position of w is $1 \}$

$re = $ ~~$1 \cdot [(1+0+1) \cdot 1]^*$~~ $1 \cdot [(1 + 0 + 1) \cdot 1]^*$

(ii) $\{ w \mid w$ has 010 as a substring $\}$

$re = (0+1)^* 010 (0+1)^*$

(iii) $\{ w \mid w$ has odd number of 0's and even number of 1's $\}$

$re = [0 \cdot (11)^* (00)^* (0110)^* (1001)^*] + [1 \cdot (01)^* (10)^* (11)^y (00)^* (0110)^* (1001)^*$

(iv) $\{ w \mid$ the length of w is at most $5 \}$

$re = (0+1+\lambda) \cdot (0+1+\lambda) \cdot (0+1+\lambda) \cdot (0+1+\lambda) \cdot (0+1+\lambda)$

(v) $\{ w \mid w$ does not contain the substring $110 \}$

$re = \lambda + 1 + [11 \cdot 1 \cdot 1 \cdot (0+1)^*] + [(0+10+110+1110)(0+1)^*]$

(vi) $\{ w \mid w$ is any string except 11 and $111 \}$
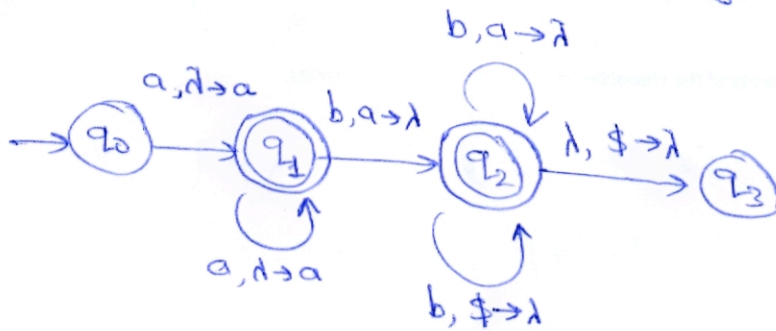
$re = [(10)^* + 0^*] \cdot 1^*$

(vii) $\{ \varepsilon, 0 \}$

$re = 0 + \varepsilon$

(II) The empty Set

$$re = \phi$$

(IX) All strings except the empty string.

$$re = (0+1)^+$$

Q4. Construct a PDA for language $L = \{0^m 1^n \mid m \neq n, m, n \geq 0\}$

Q5. Construct a Turing machine for subtracting two natural numbers m and n. ($m > n$)

$$m = 11\ldots 1$$
$$n = 11\ldots 1$$
} unary representation

Input = $m0n$.

Tape.