Banaras Hindu University
Institute of Science
Department of Computer Science

Assignment No.: 3

Subject:

"Theory Of Computation (CS202)"

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Assignment 3.

1. Write Regular Expression for the set of strings length Σ 2 over {0,1}

Soln:

R.E $r = \epsilon + (0+1) + (0+1)(0+1)$

2. Write R.E for set of string (w) over {a,b} where $n_a(w) \bmod 3 = 1$.

Soln:

$n_a(w) \bmod 3 = 1$

Number of a's accepted {1,4,7,10,---}

So.

R.E $= ba^*b^*(ab^*ab^*ab^+)^*$

③ Write R.E for set of strings (w) over {a,b} where $|w| \bmod 4 = 3$

Solution

$|w| \bmod 4 = 3$

accepted length of string = {3,7,11,---}

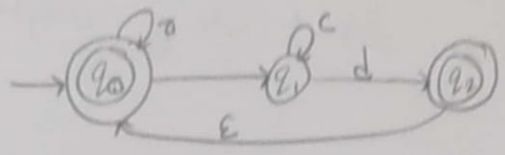
Hence

R.E $= (a+b)(a+b)(a+b)((a+b)(a+b)(a+b))^*$

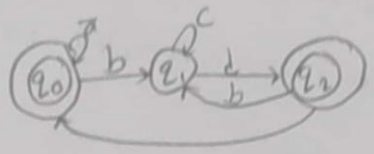
④ Convert R.E $(a+bc^*d)^+$ to ~~finite~~ finite automata

R.E $(a+bc^*d)^*$

$= (a^*(bc^*d)^*)^*$



ENFA to NFA



$\delta(q_0, a) = q_0$,
$\delta(q_0, b) = q_1$,
$\delta(q_1, c) = q_1$,
$\delta(q_1, d) = q_2$,
$\delta(q_2, b) = q_1$
$\delta(q_2, a) = q_0$

⑤ Convert finite automata to Regular expression using Arden's Theorem.

→ $q_1 = q_1 0 + q_3 0 + q_4 0 + \varepsilon$ — ①

$q_2 = q_1 1 + q_2 1 + q_1 1$ — ②

$q_3 = q_2 0$ — ③

$q_4 = q_3 1$ — ④

From ③ and ④

$q_4 = q_2 01$ — ⑤

From eq ②

$q_2 = q_1 1 + q_2 1 + q_2 011$

$= q_1 1 + q_2 (1 + 011)$

$= q_1 1 (1 + 011)^*$ — ⑥

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From ①

$$q_1 = q_1 0 + q_2 00 + q_2 010 + \epsilon$$

$$= q_1 0 + q_1 1 (1+011)^* 00 + q_1 1 (1+011)^* . 010 + \epsilon$$

$$= q_1 (0 + 1 (1+011)^* 00 + 1 (1+011)^* 010) + \epsilon$$

$$= \epsilon . r^*$$

$$= r^*$$

$$= (0 + 1 (1+011)^* (00 + 010))^* \quad - ⑦$$

since

final state = q_4

$$R.E = q_4$$

$$= q_1 1 (1+011)^* . 01 \text{ (from 5 and 6)}$$

substituting ⑦

$$R.E = (0+1 (1+011)^* (00+010))^* . 1 . (1+011)^* . 01$$