Theory Of Computation

assignment - II

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CSE - E

1. Convert the given grammar to CNF

S -> aaaaS

S -> aaaa

Soln:

S -> aaaa S

ε

S -> aaaaS | aaaa

S -> aaaa.

* remove unit production and useless symbol
* check if rules are satisfied. for each possibility.

S -> aaaa S

R1

S -> R1S

it is in CNF

S -> aaaa

S -> R2R2

it is in CNF

S -> aaaa

S -> R2R2

it is in CNF

2 S -> AB | aB

A -> aab | ε

B -> bbA.

S -> AB

ε ε

S -> A S -> B.

S -> aB

ε

S -> a

S -> bbA, ε

S -> bb.

$S \rightarrow AB \mid A \mid B \mid aB \mid a$

$A \rightarrow aab$

$B \rightarrow bbA \mid bb$.

remove unit production.

$S \rightarrow AB \mid aB \mid a$.

$A \rightarrow aab$.

$B \rightarrow bbA \mid bb$.

Remove useless symbol.

check if rules are satisfied.

$S \rightarrow AB$

$S \rightarrow aB$.
$S \rightarrow R_1B$
it is CNF

$S \rightarrow a$
it is in CNF

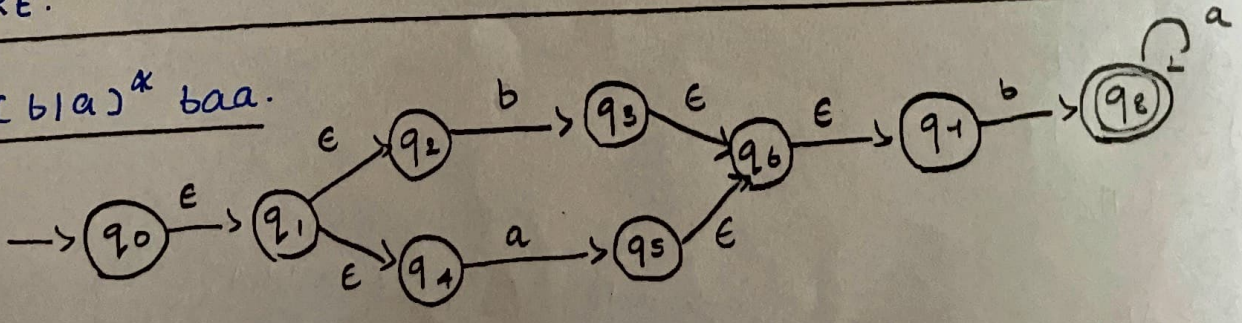
$A \rightarrow aab$
$S \rightarrow R_1R_2$
it is in CNF

$B \rightarrow bbA$
R_3
$B \rightarrow R_3A$.
it is in CNF

$B \rightarrow bb$
$B \rightarrow R_4R_5$
. it is in CNF.

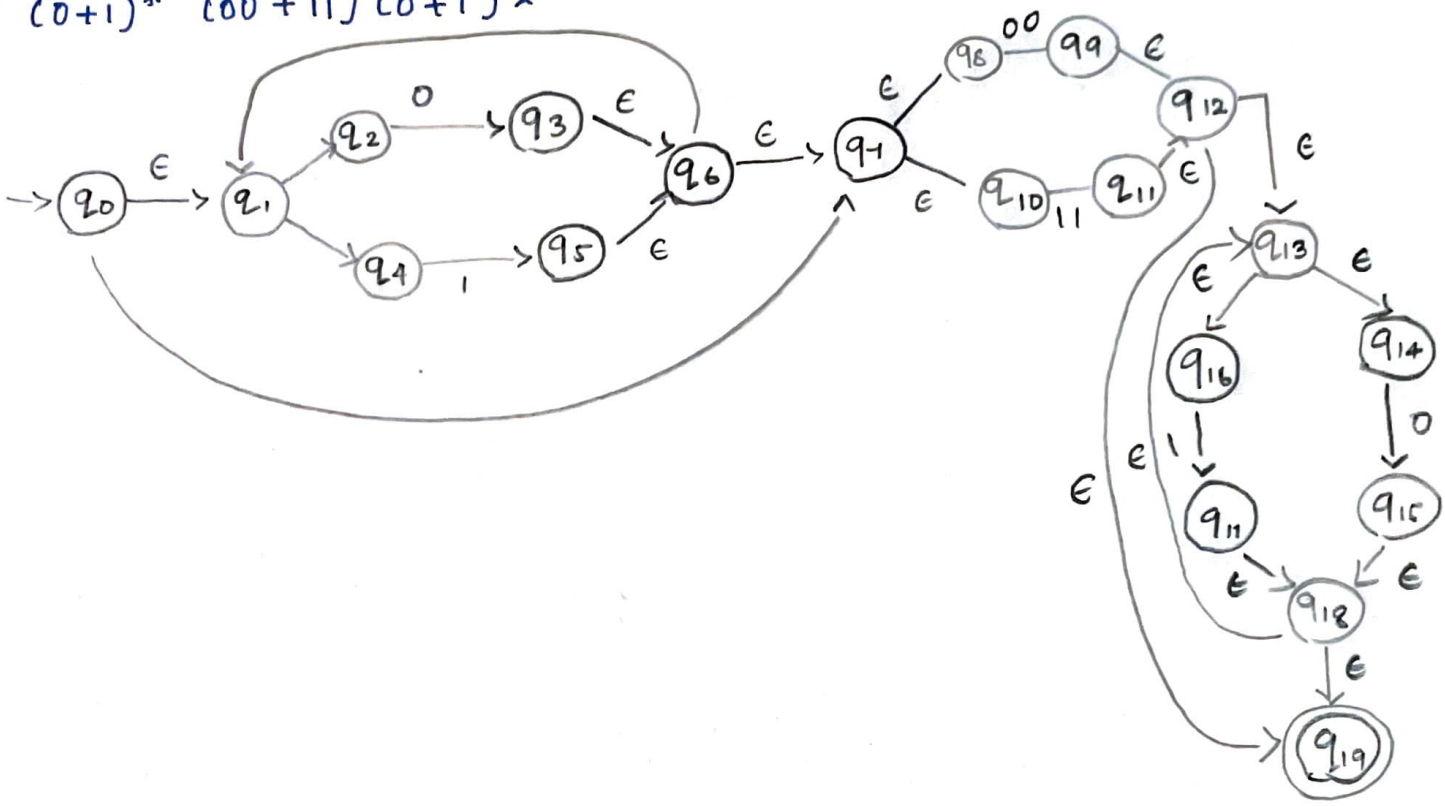
RE.

3. $(b|a)^* baa$.

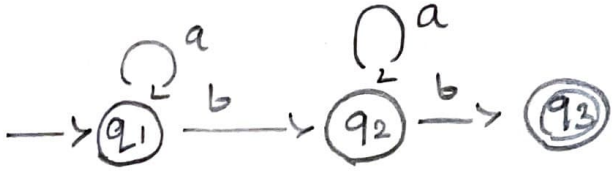


(4)

. $(0+1)^*\ (00+11)(0+1)^*$



(6)



$q_1 = q_1 a + \epsilon$

$q_2 = q_1 b + q_2 a$

$q_3 = q_2 b.$

$q_1 = q_1 a + \epsilon$

$R \quad P + Q$

$= QP^*$

$q_1 = \epsilon a^*.$

$\boxed{q_1 = a^*}$

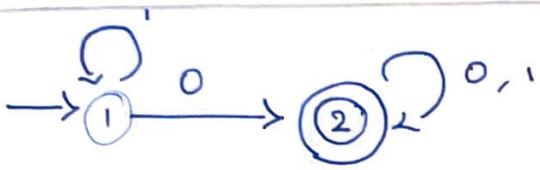
$q_2 = q_2 a + q_1 b.$

$= q_2 a + a^* b.$

$\boxed{q_2 = a^* b a^*}$

$q_3 = q_2 b$

$\boxed{q_3 = a^* b a^* b.}$



Solve using formula method. (4)

2 states:

K=0

K=1

State	Input	
	K=0	K=1
r_{11}	$\epsilon + 1$	1^*
r_{12}	0	0.1^*
r_{21}	ϕ	ϕ
r_{22}	$\epsilon + 0 + 1$	$\epsilon + 0 + 1$

K=1

$$r_{ij}^{K} = r_{ij}^{K-1} + r_{ik}^{K-1} (r_{kk}^{K-1})^* r_{kj}^{K-1}$$

$$r_{11}^{1} = r_{11}^{0} + r_{11}^{0} (r_{11}^{0})^* r_{11}^{0}$$

$$= (\epsilon+1) + (\epsilon+1)(\epsilon+1)^* (\epsilon+1)$$

$$= (\epsilon+1)[\epsilon + (\epsilon+1)(\epsilon+1)^*]$$

$$= (\epsilon+1)(\epsilon+1)^*$$

$$= (\epsilon+1)(1)^*$$

$$= 1^*$$

$$r_{12} = r_{12}^0 + r_{11}^0 (r_{11}^0)^* r_{12}^0$$

$$= 0 + (\epsilon+1)(\epsilon+1)^* 0$$

$$= 0 (\epsilon + (\epsilon+1)(\epsilon+1)^*)$$

$$= 0 ((\epsilon+1)^*)$$

$$= 0.1^*$$

$$r_{21} = r_{21}^0 + r_{21}^0 (r_{11}^0)^* r_{11}^0$$

$$= \phi + \phi (\epsilon+1)^* (\epsilon+1)$$

$$= \phi (\epsilon + (\epsilon+1)^* (\epsilon+1))$$

$$= \phi (\epsilon+1)^*)$$

$$= \phi (1^*)$$

$$= \phi$$

$$r_{22} = r_{22}^0 + r_{21}^0 (r_{11}^0)^* r_{12}^0$$

$$= (\epsilon + 0 + 1) + \phi (\epsilon+1)^* 0$$

$$= (\epsilon + 0 + 1) + \phi (\epsilon+1)^* 0$$

$$= (\epsilon + 0 + 1) + \phi (1^*) 0$$

$$= \phi (\epsilon + 0 + 1)$$

$$r_{12}^{2} = r_{12}^{1} + r_{12}^{1} (r_{22}^{1})^{*} r_{22}^{1}$$

$$= (0.1^{*}) + (0.1^{*})(\epsilon + 0 + 1)^{*} (\epsilon + 0 + 1)$$

$$= (0.1^{*}) [\epsilon + (\epsilon + 0 + 1)(\epsilon + 0 + 1)^{*}]$$

$$= (0.1^{*}) (\epsilon + 0 + 1)^{*}$$

$$= (0.1^{*}) (0 + 1)^{*}$$