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DEPT : BSCS

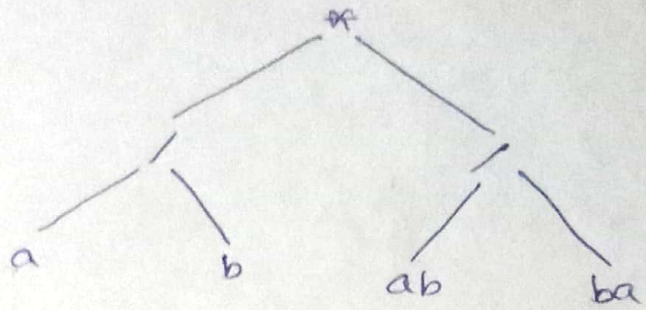
SUBJECT : THEORY OF AUTOMATA

## QUESTION 1

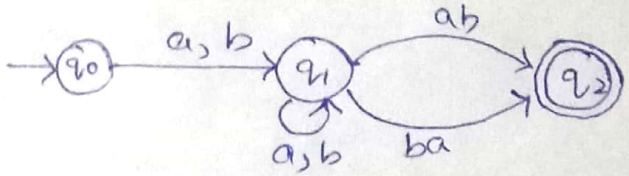
$(a/b)^*(ab/ba)$

## SOLUTION:

→ Parse Tree:




→ NFA




## QUESTION 2

Regular Expressions

i) $(a+b)^*$
ii) $(aa+b)^*$
iii) $(aaa+b)^*$
iv) $(a+b)^*b$
v) $b(a+b)^*$

## QUESTION 3

(a) Prove that

$$(a/b)^* != a^* b^*$$

## SOLUTION:

a/b means a or b

$(a/b)^*$ → strings of a's or b's or both

$a^*$ means strings of a's

$b^*$ means strings of b's

(a) $a^*b^*$ means strings of a's followed by strings of b's

Now

$(a/b)^*$ means no sure sequence. It can be aa, ab, ba, bb whereas $a^*b^*$ means ab, aabb, abb.

Hence proved that

$(a/b)^* \neq a^*b^*$

(b) Derive language descriptions for the following R.E

(i) $(a/b)(a/b)\,b(a/b)^*$

Language for words over $\{a,b\}$ which starts with 'aa' or 'ab' or 'ba' or 'bb' followed by b and ends with any letter.

(ii) $(a/b)^*\,b(a/b)(a/b)$

$L = \{a,b\}$ where string starts with any letter followed by 'b' and ends with 'aa' or 'ab' or 'ba' or bb.

(iii) $(a/b)^*(aa/bb)$

$L = \{a,b\}$ where last symbol must be two a's or two b's.
string must end with 'aa' or 'bb'.

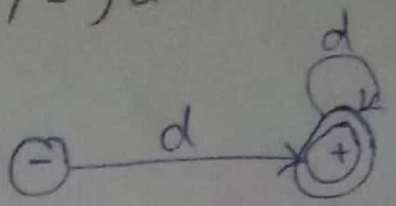
(iv) $(aa/bb)(a/b)^*$

$L = \{a,b\}$ where first symbol must be aa or bb
string must start with 'aa' or 'bb'.

## QUESTION 4 : NFA

(3)

(i) $(+/-)d^+$




(ii) $(a/b)^*(aaa/bbb)(a/b)^*$