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Theory of Automata

Assignment # 01

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Q1:-

Rule 1:- λ, aa, ab, bb and ba are in Evenstring

Rule 2:- If x is in evenstring then so is xx in Evenstring as well

Rule 3:- No strings allowed other than those defined in Rule 2.

b,

Rule 1:- a and b are in oddstring

Rule 2:- If x is in oddstring then so is xxx in oddstring as well

Rule 3:- No string other than those defined in Rule 2.

c, Rule 1: aa, aab and baa are in AA.

Rule 2: If x is in AA then so is xb and bx are also in AA

Rule 3: No strings other than those defined in Rule 2.

d, ~~c~~

Rule 1: a, b are in NOTAA.

Rule 2: If x is in NOTAA then so is xb and bx in NOTAA as well.

Rule 3: No strings other than those defined in Rule 2.

(2)

e)

By the given rule 2 of the definition of 6 distinct permutations

\Rightarrow 123 by rule 1

\Rightarrow so is 231 by using rule 2 (yzx)

\Rightarrow as well as 321 by rule 2 (zyx)

\Rightarrow taking 231 as xyz

\Rightarrow 231 by rule 1 so is 132

\Rightarrow by using rule 2 and 321

\Rightarrow we have $\Sigma = \{123, 132, 231, 213, 312, 321\}$

f, By using Rule 2 of definition we have 8 distinct permutations. (2×4)

\Rightarrow 1234 by Rule 1

\Rightarrow 4321 by using Rule 2 \Rightarrow wzyx

\Rightarrow 2341 by using Rule 2 $=$ yzwx

g,

Rule 1: 1, 2, 6 is in factorial.

Rule 2: n factorial i.e. $n! = n \cdot (n-1)!$ are also in factorial

Rule 3: No string other than that defined in Rule 3.2.

h, By given factorial definition we make parts of $3!$, $5!$ and $(3-4)!$

\Rightarrow By using Rule 2 of recursive definition both $3!$ and $5!$ are possible.

\Rightarrow However $(3-4)!$ is invalid and generates $(-1)!$ which is not possible.

Question Number 2:-

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1) $(a+b)^* aa (a+b)^*$

2) $(b+ab)^* (\lambda + aa) (b+ab)^* (\lambda + aa) (b+ba)^*$

3) $(\lambda + ((1-a)(0-a))^*) (1+3+5+7+9)$

4) ~~4)~~ Proper details not provided.

5) $(a+b)^* aa (a+b)^* abaa (a+b)^* + (a+b)^* abaa (a+b)^* + (a+b)^* aba (a+b)^* aa (a+b)^*$

6) $(0+1)^* (\lambda + 00 + 11 + 10)$

7) $(0+10)^* 1^* 0^* (\lambda+1)$

8) $a^*(b(bb)^* aa^*) (\lambda + b(bb)^*)$

9) $(aa + bb + (ab+ba)(aa+bb)^* (ab+ba))^* b$
 $(aa + bb + (ab+ba)(aa+bb)^* (ab+ba))^*$

10) $(ab+ba)(aa+bb)^* + (aa+bb)^* (ab+ba)$

Question Number 3:

- 1) All the strings that have 101.
- 2) All strings should have 1, 0 and 1.
- 3) All the strings having 0's which are not more than three.
- 4) All the strings have even number of length.
- 5) All the strings have consecutive even number of a's and odd number of b's.
- 6) All the strings must have ~~even~~ 3 or more number of b's.
- 7) All the strings ending with 010.
- 8) All the strings have no more than 3 a's.
- 9) All the strings should have a and b.