Assignment-1

Theory of Automata

Syed Asad Zaman
p180034(b)

Descriptive Definitions

L1

A string having any length but of odd numbers in which the letter “a” always comes in middle.

sigma = {a , b}

L1: { a, aaa, bab, aab, baa, aaaaa, aaaab, aaaba, abaaa, baaaa, aaabb, ababb }

L2

A string having the initial and ending letter same of any length.

Sigma = {a , b}

L2: { λ ,a, b, aa, bb, aaa, aba, bab, bbb, aaaa, aaba, abaa, abba, baab, babb, bbbb }

L3

A String of any length with the number of letter ‘a’ would always be greater then number of letter ‘b’ in a string.

Sigma = {a, b}.

L3: { a, aa, aaa, aab, aba, baa, aaaa, aaab, aaba, abaa, baaa, aaab, aaaab, aaaba }

L4

A string of any length with adding first and last letter of string is always equal to 1.

Sigma = {0, 1}.

L4: { 01, 10, 001, 010, 100, 0001, 0011, 0101, 0111, 1000, 1100, 1110 }

L5

A string of any length with each letter comes consecutively more than one time in a string with a sigma = {a, b}.

L5: { aa, bb, aab, bba, , aaaa, aabb, bbaa, bbbb, aaaaa, aaabb, bbaaa, bbbbb }

L6

A string of any length with letters which is divisible by 2 in a string.
sigma = {1, 2, 3, 4}.
L6: { 2, 4, 22, 24, , 42, 44, 222, 224, 242, 244, 422, 442, 424, 444 }

L7

A string of any length with adding first two letters of string equal to third letter.
sigma = {1, 2, 3, 4}.
L7: { 123, 213, 224, 134, 314, 1231, 1232, 1233, 1234, 1341, 1342, 1343, 1344}

L8

A string of any length with ‘cat’ will be in every string.
sigma = {a, b, c, d}.

L8: { cat, acat, bcat, ccat, dcat, aacat, abcat, accat, adcat, bacat, bbcat, bccat, bdcat}

L9

A string of any length with letter ‘a’ can never come in last of the string.
sigma = {a, b, c, d}.
L9: { λ , b, bb, ab, aab, abb, bab, bbb, , aaab, aabb, abbb, abab}

L10

A string of any length which starts and ends with letter ‘a’ and equal number of letter ‘b’ in this string
Sigma = {a, b}

L10: {abba, aabbba, ababba, abbaba, abbbaa, aaabbbba, aababbba, aabbabba, aabbbaba, aabbbbaa}

Recursive Definitions

L1
Definition of the Set of Nonnegative Even Numbers (X)
Suppose Even Numbers = X
Then

1. $0 \in X$
2. For any element n in X, X + 2 is in X
3. Nothing is in X unless it is obtain from Step 1 and Step 2

L2.
Definition of the Set of Even Integers(Y)

Suppose Even Integers = Y

1. $0 \in Y$
2. For any element x in **Y** , $x + 2$, and $x - 2$ are in **Y**
3. Nothing is in Y unless it is obtained from the Step 1 and Step 2

L3.

Recursive Definition of Prime Numbers

Suppose Prime Numbers = N

1. 2 ∈ n
2. For any element *x* in N, ***x/x*** and x/1 are in N
3. Nothing is in ***N*** unless it is obtained from the Step 1 and Step 2

L4.

Definition of the Set of Strings **S** over the alphabet {a,b}

1. a ∈ S and b ∈ S
2. For any element **n** in **S**, ***an*** ∈ S and ***bn*** ∈ **S**
3. Nothing is in ***S*** unless it is obtained from the Step 1 and Step 2