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MATRIC NUMBER: 17/SCI01/019

COURSE CODE: CSC304

COURSE TITLE: Theory of Computing

ASSIGNMENT

1. The production rule S→aSa|bSb|a|b|λ generates a palindrome Language; PAL={w∈ {a,b}^\* |w=w^R }; define at least ten (20) set of strings produced by this grammar (Note: show how you generate your strings using sentential derivation).
2. Consider the following grammar G = (V,T, S, P), and identify languages generated by it
3. S→aS|bS|a|B
4. S→ aSa|bSb|aSb|λ

iii. S→aAb|aBb|aSb, A →aA|a, B →bB|b

1. In algebraic form, summarize the language generated by the following grammar
2. S→aAb, A→aA|bA|λ
3. S→aSb|ab
4. S→aSc|aAc, A→aAb|ab
5. S→AB, B→bB|b, A→aA|a
6. How do we generate this grammar from the language L(G)={a^n b^m |n≥m}
7. Given the following grammar S→aS|bS|a|b , derive strings of the form: i. babbaa iii. aaabaa ii. babababa iv. baabaaa
8. Construct the grammar for set of all strings, where:
9. (w∈{a,b}| |w|mod 2=0).
10. (w∈{a,b}| |w|mod 2=1)
11. (w∈{a,b}| |w|mod 3=0)
12. (w∈{a,b}| |w|mod 3=2)
13. With the same power.
14. each string is starting and ending with the same symbol

Soln

25.

S→aSa|bSb|a|b|λ

S→λ

S→a

S→b

S→aSa→aa

S→bSb→bb

S→aSa→aaa

S→aSa→aba

S→bsb→bab

S→bSb→bbb

S→aSa→aaSaa→aaaa

S→aSa→abSba→abba

S→bSb→baSab→baab

S→bSb→bbSbb→bbbb

S→aSa→aaSaa→aaaaa

S→aSa→aaSaa→aabaa

S→aSa→abSba→ababa

S→aSa→abSba→abbba

S→bSb→baSab→baaab

S→bSb→baSab→babab

S→bSb→bbSbb→bbabb

L(G)={λ, a, b, aa, bb, aaa, aba, bab, bbb, aaaa, abba, baab, bbbb, aaaaa, . . .}

Algebra= {ax by an bm by ax|x,y,n,m>=0}

26.

1. S→aS|bS|a|b

S→a

S→b

S→aS→aa

S→aS→ab

S→bS→ba

S→bS→bb

S→aS→aaS→aaa

S→aS→aaS→aab

S→aS→abS→aba

S→aS→abS→abb

L(G)={a,b,aa,ab,ba,bb,aaa,aab,aba,abb, …}

1. S→ aSa|bSb|aSb|λ

S→λ

S→aSa→aa

S→aSb→ab

S→bSb→bb

S→aSa→aaSaa→aaaa

S→aSb→aaSab→aaab

S→aSa→aaSba→aaba

S→aSa→abSba→abba

S→aSb→abSbb→abbb

S→bSb→bbSbb→bbbb

L(G)={λ,aa,ab,bb,aaaa,aaab,aaba,abba,abbb,bbbb, …}

III.S→aAb|aBb|aSb, A →aA|a, B →bB|b

S→aAb→aab

S→aBb→abb

S→aAb→aaAb→aaab

S→aBb→abBb→abbb

S→aSb→aaAbb→aaabb

S→aSb→aaBbb→aabbb

L(G)={aab, abb, aaab, abbb, aaabb, aabbb, …}

27.

1. S→aAb, A→aA|bA|λ

S→aAb→ab

S→aAb→aaAb→aab

S→aAb→abAb→abb

S→aAb→aaAb→aaaAb→aaab

S→aAb→aaAb→aabAb→aabb

S→aAb→abAb→abbBb→abbb

S→aAb→aaAb→aaaAb→aaaaAb→aaaab

S→aAb→aaaAb→aaabAb→aaabb

S→aAb→aaAb→aabAb→aabab

Algebra=(ambn|m,n>0)

1. S→aSb|ab

S→ab

S→aSb→aabb

S→aSb→aaSbb→aaabbb

S→aSb→aaSbb→aaaSbbb→aaaabbbb

S→aSb→aaSbb→aaaSbbb→aaaaSbbbb→aaaaabbbbb

Algebra=(ambm|m>0)

1. S→aSc|aAc, A→aAb|ab

S→aAc→aabc

S→aAc→aaAbc→aaabbc

S→aAc→aaAcc→aaabcc

Algebra=(aqbmcn|q=m+n m,n>0)

1. S→AB, B→bB|b, A→aA|a

S→AB→aB→ab

S→AB→aAB→aab

S→AB→AbB→Abb→abb

Algebra=(ambn|m,n>0)

1. anbm|n>=m

L(G)={λ ,a,ab,aab,aabb,aaabb,…}

G=({S,A},{a,b},S,P)

P:

S→aA|λ|aS

A→aAb|b

1. S→aS|bS|a|b
2. S→bS→baS→babS→babbS→babbaS→babbaa
3. S→aS→aaS→aaaS→aaabS→aaabaS→aaabaa
4. S→bS→bas→babS→babaS→bababS→bababaS→babababS→babababa
5. S→bS→baS→baaS→baabS→baabaS→baabaaS→baabaaa
6. Construct the grammar for set of all strings, where:
7. (w∈{a,b}| |w|mod 2=0).

L(G)={λ ,aa,ab,ba,bb,aaaa,…}

G=({S},{a,b},S,P)

P:

S→aSa|λ|aSb|bSa|bSb

1. (w∈{a,b}| |w|mod 2=1)

L(G)={a,b,aaa,aab,abb,baa,…}

G=({S,A},{a,b},S,P)

P:

S→aA|bA

A→aAb|aAa|bAa|λ|bAb

1. (w∈{a,b}| |w|mod 3=0)

L(G)={a,b,aaa,aab,abb,baa,…}

G=({S,A,B},{a,b},S,P)

P:

S→aA|bA|a|b

A→aB|bB|a|b

B→aS|bS

1. (w∈{a,b}| |w|mod 3=2)
2. With the same power.

L(G)={λ,ab,,aabb,aaabbb,…}

G=({S},{a,b},S,P)

P:

S→aSb|λ

1. each string is starting and ending with the same symbol

L(G)={λ,a,b,aa,bb,aba,bab,…}

G=({S,A},{a,b},S,P)

P:

S→aAa|bAb|a|b

A→λ|aAb|bAb|bAa|aAa|a|b