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Context Free Language Part-3

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Content:

1. Basic concept of CFG
2. Questions of CFG
3. Questions on Regular Expression

Properties of CFG

CFG is closed under:-

1.Union

2. concatenation

3. kleen star

4.Reverse

5.Inverse Homomorphism

CFG is not closed under:

1. Intersection
2. Complement

Decidability for CFG'S :

No fixed algorithms exist for all these:

1. How can we tell whether or not 2 different CFG'S define the same language.
2. Given a particular CFG, how can we tell whether or not is ambiguous.

3. Given a CFG .i.e. ambiguous, how can we tell whether or not there is a different CFG that generates the same language but it is not ambiguous.
4. How can we tell whether or not,the compliment of a given context free language is also context free.
5. How can we tell whether or not, the intersection of 2 context free language is also context free.
6. Given 2 CFG'S ,how can we tell, whether or not, they have a word in common.
7. Given a CFG , how can we tell whether or not there are any words that it does not create.

Two CFG'S given L_1&L_2

1. Union of L_1&L_2 is also CFG.
2. Concatenation of L_1&L_2 is also CFG.
3. Kleen star of L_1&L_2 is also CFG.
4. Reverse of L_1&L_2 is also CFG.

For these, algorithm exists:

1. Given a CFG, there is an algorithm to determine whether or not, it can generate any word at all.(means it is empty or not).
2. There is an algorithm to decide whether or not, a given non- terminal X in a given CFG is ever used in generation of words.
3. There is an algorithm to decide whether a given CFG, generates an infinite language or finite language.
4. Given a CFG and a string x in the same alphabets, we can decide whether or not x can be generated by CFG. This is called CYK algorithm.

Q.

G_1: S→AB/aaB

A→a/Aa

B→b

S---→AB S----→aaB

=AaB =aab

=aab

G_1 is ambiguous

G_2: S---→aSbS/bSaS/

S--→ aSbS

=AbSaSbS

=abab

S--→ aSbS

=aSbaSbS

=abab

G_2 is ambiguous

S_1 : S -> aSb/bsa/ss/a

S→ asb/bsa/a

S→ aSb S→aSb

→aSSb =aab

=aaab

Not equivalent

S_2 S→ SS/SSS/aSb/bSa/ λ

S→ SS/asb/bsa / λ

S→ SSS

= aSbaSbaSb

S→ SS

=aSbaSb

= abSabab

= ababab

Equivalent

G_1: S_1→AB/aaB

A→a/Aa

B→ b

S_1→AB

=Aab

=aaB

=aab

S_1→ aaB

=aab

G_1 is ambiguous

G_2: S_2→ $aS_2bS_2/bS_2aS_2aS_2/$

$S_2 \rightarrow aS_2\ bS_2$

$=aS_2aS_2bS_2$

$=abab$

$S_2 \rightarrow aS_2\ bS_2$

$=abS_2$

$=abaS_2bS_2$

$= abab$

G_2 is ambiguous

Q1. Which of the following languages over the alphabet{0,1}is described by the regular expression?

$(0+1)^*0(0+1)^*0(0+1)^*$

a) The set of all strings containing the substring 00.

b) The set of all strings containing at most two 0's.

c) The set of all strings containing at least two 0's.

d) The set of all strings that begin and end with either 0 or 1.

Answer-C

Q2. The regular expression $0^*(10)^*$describes the same set as

a) $(1^*0)^*1^*$

b) $0+(0+10)^*$

c) $(0+1)^*10(0+1)^*$

d) None of these

Answer- C

Q.3Given the language L={ab,aa,baa}, which of the following strings are in L^*?

a) abaabaaabaa

b) aaaabaaaa

c) baaaaabaaaab

d) baaaaabaa

A) A,B&C

B) B,C&D

C) A,B&D

D) A,C&D

Answer- C

Q4. Let w be any string of length n is {0,1}*. Let L be the set of all substrings of w. What is the minimum number of states in a non- deterministic finite automation that accepts L?

a) n-1

b) n

c) n+1

d) 2n-1

Answer-C

Q5. The length of the shortest string NOT in the language (over Σ=(a,b})of the following regular expression is _____ $a^*b(ba)^*a^*$

a) 2
b) 3
c) 4
d) 5

Answer-B

Q6. Which one of the following regular expressions is NOT equivalent to the regular expression$(a+b+c)^*$?

a) $(a^*+b^*+c^*)^*$

b) $(a^*\ b^*\ c^*)^*$

c) $((ab)^*+c^*)^*$

Answer-C

Q7. Which of the following regular expressions describes the languages over {0,1}consisting of strings that contain exactly two 1's?

a) $(0+1)^*11(0+1)^*$

b) 0^*110^*

c) $0^*10^*10^*$

d) $(0+1)^*1(0+1)^*1(0+1)^*$

Answer-C

Q8. Consider the regular expression (0+1)(0+1)…n times. The minimum state finite automation that recognizes the language represented by this regular expression contains:

a) n states

b) n+1 states

c) n+2 states

d) none of the above

Answer-B

Q9. The string 1101 does not belongs to the set represented by

a) 110(0+1)

b) $1(0+1)^*\ 101$

c) $(10)^*\ (01)^*\ (00+11)^*$

d) $(00+(11)^*0)^*$

Answer- C AND D

Q10. Which one of the following regular expressions over {0,1} denotes the set of all strings not containing 100 as a substring?

a) $0^*(1+0)^*$
b) 0^*1010^*
c) $0^*1^*01^*$
d) $0^*(10+1)^*$

Answer-D

Q11.Which of the following strings would match the regular expression:
P+[3-5] [xyz]?

I. P443Y
II. P6Y
III. 3XYZ
IV. P35z
V. P353535x
VI. ppp5

a) I,III and VI only
b) IV,V and VI only
c) II,IV and V only
d) I,IV and V only

Answer-D

Q12. Consider the following identities for regular expressions:

a) $(r+s)^*=(s+r)^*$

b) $(r^*)=r^*$

c) $(r^*s^*)^*=(r+s)^*$

Which of the above identities are true?

A) (a) and(b) only

B) (b) and(c) only

C) (c)and(a) only

D) (a),(b)and(c)

Answer-D

Q13. The number of strings of length 4that are generated by the regular expression (0+1+[2+3)*,where I is an alternation character and{+,*} are quantification characters,is:

a) 08

b) 09

c) 10

d) 12

Answer-C

Q14.Which one of the following is not a greibach normal from grammar?

i) S→a|bA|aA|bB A→a

ii) S→a|aA|AB A→a

iii) S→ a| A| aA A→a

A) (II) B) (II)AND (III) C) (II)AND (III) D) (I),(II)AND(III)

Answer-C

Q14. The equivalent grammar corresponding to the grammar G:S→aA, A→BB,B→aBb|E is

a) S→ aA, A→BB, B→ aBb
b) S→ a|aA, A→BB, B→aBb | ab
c) S→ a | Aa , A→BB | B,B→aBb
d) S→ a | aA, A→BB | B, B→aBb | ab

Answer-D

Q15. Give the following statements:

S_1 : Every context- sensitive language L is recursive.

S_2 : there exists a recursive language that is not context sensitive

Which statement is correct?

a) S_1 is not correct and S_2 is not correct?
b) S_1 is not correct and S_2 is correct?
c) S_1 is correct and S_2 is not correct?
d) S_1 is correct and S_2 is correct?

Answer-D

Q16. The regular grammar for the language L={w[n_a(w)and n_b(w) are both e en,w E {a,b} ∗} is given by:

a) P→aq | λ,q→bs |ap
   r→as| |bp, S→ar | bq,p and s
   are initial and final states
b) P→ aq | br , q→ bs | ap
   r→as |bp, S→ ar | bq,p and s
   are initial and final states
c) P→ aq | br| λ,q→bs|ap
   r→ as| bp, S→ ar|bq
   p is both initial and final states
d) P→ aq | br. q→ bs |ap
   r→as |bp, S→ar |bq
   P is both initial and final states.

Answer-C

Q17.The following context - free grammar (CFG):

Q: S→aB | bA

A→ a | as | bAA

B→ b | bs | aBB

Will generate

a) odd numbers of a's and odd numbers of b's

b) even numbers of a's and even numbers of b's

c) equal numbers of a's and b's

d) different numbers of a's and b's

Answer-C

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