COS2601

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LKE MNCUBE

Question 1

1. The set {a b}\* will be suitable because it contains, along with other words, all the words in the language ODDnotAB
2. The generators are a and b

1. The function CONCAT as defined in learning unit 3 will be suitable.
2. Two possible recursive definitions:

**First:**

ODDnotAB is the smallest subset of {a b}\*

such that a, b ∈ ODDnotAB

and if Q ∈ ODDnotAB,

then also CONCAT( bb, Q ) ∈ ODDNOTAB

and CONCAT( Q , aa) ∈ ODDNOTAB,

and

if Q ∈ ODDNOTAB and Q does not end on a ,

then CONCAT( Q , ba ), CONCAT( Q, bb ) ∈ ODDNOTAB,

if Q ∈ ODDNOTAB and Q does not begin with b ,

then CONCAT( aa, Q ), CONCAT( ba, Q ) ∈ ODDNOTAB

**Second:**

Rule 1: ab ∈ ODDNOTAB.

Rule 2: If Q ∈ AB then CONCAT(bb, Q) ∈ AB.

Rule 3: If Q ∈ AB then CONCAT(Q, aa) ∈ AB.

Rule 4: If Q ∈ AB then CONCAT( Q , ba ) ∈ AB

and CONCAT( Q, bb ) ∈ ODDNOTAB

Rule 5: If Q ∈ AB then CONCAT( aa, Q ) ∈ AB

and CONCAT( ba, Q ) ∈ ODDNOTAB

Rule 6: Only words generated by rules 1 to 5 are in AB.

Question 2

1. Rule 1: 1 ∈ P.

Rule 2: If x ∈ P then x+1 ∈ P.

Rule 3: P is the smallest set satisfying R1 and R2.

1. Let S = { n | n ∈ Z+, 11 + 15 + 19 + … + (4n + 7) = 2 + 9n}

Step 1:

Is 1 ∈ S? Yes, since 4+7=11 and 2+9=11

Step 2:

Assume k ∈ S, hence 11 + 15 + 19 + … + (4k + 7) = 2 + 9k

Step 3:

Is k + 1 ∈ S? Yes, proof:

11 + 15 + 19 + … + (4k + 7) + (4(k+1) + 7) = 2 + 9(k+1)

LHS =4(k+1)+7

=4k+11

RHS =2 + 9(k+1)

=

=

=

From Step 2, we know that 11 + 15 + 19 + … + (4k + 7) = 2 + 9k

So LHS = RHS

Hence, k + 1 ∈ S. Thus S = Z+.

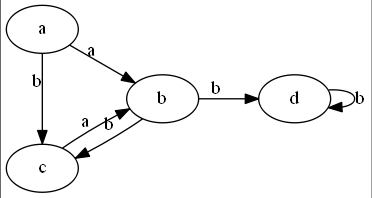
Question 3

M = (b\*ab\*)+(ab(ab\*))

Question 4

L = (a+ba)baa\*

Question 5



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Question 6

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Question 7