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BCSC01/0020/2019

AUTOMATA THEORY

Assignment 2.

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Unit : Automata theory

Assignment two.

a.) Prove or Disapprove the following statements.

i.) Let $L_4 = L_1 L_2 L_3$. If L_1 and L_2 are regular and L_3 is not regular, it is possible that L_4 is regular.

Answer:

Let $L_1 = \{\varepsilon\}$
Let $L_2 = a^*$
Let $L_3 = a^p$ where p is prime
~~Let~~ L.

$L_4 = a^k$ where $k \geq 2$
L_1 is regular
L_2 is regular
L_3 is not regular
L_4 is regular because its defined by aaa^*

ii.) $0^n 1^{2n}$ is context free, $n >= 1$

Answer:

$L = \{abb, aabb, aaabbb \ldots\}$
Grammar may be:
$S \rightarrow aSbb$
$S \rightarrow abb$

To derive aaabbbbbb
$S \rightarrow aSbb$
$S \rightarrow aaSbbbb$ $\{S \rightarrow aSbb\}$
$S \rightarrow aaabbbbbb$ $\{S \rightarrow abb\}$

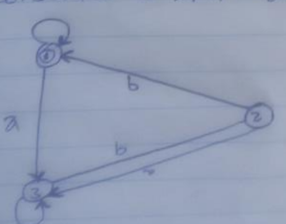
b.) Let $L = \{w \in \{a,b\}^* : w$ does not end in $ab\}$

i.) show a regular expression that generates L.

Answer:

RE is $\varepsilon \cup b \cup (a \cup b)^* (a \cup bb)$

ii.) Construct a DFA that accepts L.



c) Explain the statement "N = NP" when a problem is considered to be NP - complete.

Answer:

This is a problem in which a correction of each solution can be ratified quickly and a brute force search algorithm can find a solution by actually trying all the available possible solutions. This can be used to stimulate other problems for which we can quickly rectify that a solution is solved.

d.) Provide a context free grammar that generates $L = \{a^n b^m : n < m\}$

$L = \{abb, aabbbb, aaabbbbbb, \ldots\}$

$P = \{S \rightarrow aSbb \mid abb\}$

$S \rightarrow aSbb \rightarrow aaSbbbb \rightarrow aaaSbbbbbb \rightarrow aaabbbbbb$

CFG, $G = (\{S\}, \{a, b\}, P, S)$

e) Given: $L_1 = \{x \in \Sigma^* \mid x$ contains even no's of 0's$\}$ $L_2 = \{x \in \Sigma^* \mid x$ contains odd no's of 1's$\}$

i.) Give language $L_1 \cup L_2$.

Answer:

$L_1 = \{00, 0000, 000000, 00000000, \ldots\}$

$L_2 = \{11, 1111, 111111, 11111111, \ldots\}$

so $L_1 \cup L_2$ is:

$\{00, 0000, 000000, \ldots, 1, 1111, 111111, \ldots\}$

ii.) Give language $L_1 \cap L_2$

Answer:

$L_1 = \{00, 0000, 000000, \ldots\}$

$L_2 = \{1, 1111, 111111, \ldots\}$

$\therefore L_1 \cap L_2$ is

$\{001, 00111, 0011111, \ldots, 00011, 0000111, 0000, 11111, \ldots\}$