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FACULTY OF BUSINESS, COMPUTER SCIENCE AND COMMUNICATION

BACHELOR OF COMPUTER SCIENCE

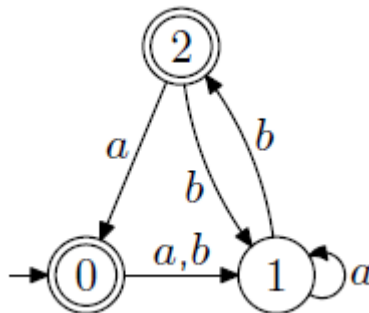
SEPTEMBER-DECEMBER 2019/2020 SEMESTER

CSC 2210 AUTOMATA THEORY

ASSIGNMENT

a) Mathematically define a DFA that accepts the language of all strings over alphabet $\{a, b\}$ in which each b is separated from the next by at least 100 a 's.

b) Convert the following NFA to a regular CFG:



c) Consider the following CFG:

$S \rightarrow aB \mid bA \mid D \mid E$

$A \rightarrow a \mid aS \mid bAA \mid c$

$B \rightarrow b \mid bS \mid aBB \mid c$

$D \rightarrow dD \mid Dd \mid d$

$E \rightarrow EE \mid EdE$

- i. Give a left-most derivation of the string $aabbcc$.
- ii. Give a right-most derivation of the same string.

iii. Is the grammar ambiguous? Why or why not?

d) Write a CFG that generates the language of ALL palindromes over alphabet $\{a, b\}$ that do not contain the substring aa .

e) Prove that the language $L_1 = \{a^i b^j c^k \mid j < i, j < k\}$ is NOT context-free.

f) Prove that the following decision problem is NOT Turing-decidable by reducing the universal language (L_U) to it: *Given two TM's A_1 and A_2 , does $|L(A_1) \cap L(A_2)| = 2$? That is, are there exactly 2 strings that are accepted by both A_1 and A_2 ?*

N/B: Assignment submission and presentation will be on 19th November 2019.

Make sure all of you participate and work on the assignment.

CAT on 5th November 2019.

You will do the presentation and you will also submit written copies of the same assignment for filing purposes. Thank you.