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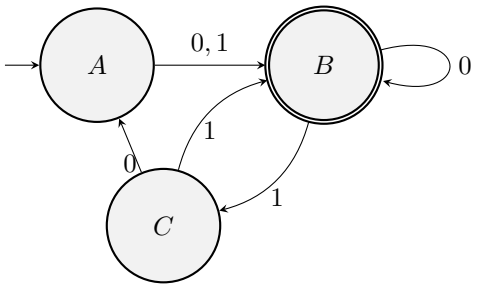
COS 210 Worksheet 8

- This worksheet consists of **5 questions** for a total of **13 marks**.
- Show your working for all calculations and reasoning.

Question 1 ..... (4 marks)

Apply the construction given in the proof of Theorem 3.3.1 to convert the following DFA M to a context-free grammar G which accepts the same language $L(M)$. Give the 4-tuple for G.



Question 2 ..... (2 marks)

Consider the ruleset for a context-free grammar, where $V = \{S, A, B\}$, $\Sigma = \{0, 1\}$, and S is the start variable Perform Step 2 of converting the ruleset to be in Chomsky Normal Form: eliminate all ϵ-rules. Show all steps.

S $\rightarrow$ A
A $\rightarrow$ 0A | 1B | B
B $\rightarrow$ 0B | 1A | ϵ

Question 3 ..... (3 marks)

Consider the ruleset for a context-free grammar, where $V = \{S, A, B\}$, $\Sigma = \{0, 1\}$, and S is the start variable Perform Step 3 of converting the ruleset to be in Chomsky Normal Form, that is, eliminate all unit-rules. Show all steps.

S $\rightarrow$ A
A $\rightarrow$ 0A | 1A | B
B $\rightarrow$ 0 | 1 | B

Question 4 ..... (2 marks)

Consider the ruleset for a context-free grammar, where $V = \{S, A, B\}$, $\Sigma = \{0, 1\}$, and S is the start variable . Perform Step 4 of converting the ruleset to be in Chomsky Normal Form, that is, eliminate all rules having more than two symbols on the right hand side. Show all steps.

S $\rightarrow$ AA
A $\rightarrow$ BAB | 0A | 1B
B $\rightarrow$ BABA | 1A | 0B

Question 5 ..... (2 marks)

Consider the ruleset for a context-free grammar, where $V = \{S, A, B\}$, $\Sigma = \{0, 1\}$, and S is the start variable.

Perform Step 5 of converting the ruleset to be in Chomsky Normal Form, that is, eliminate all rules, whose right hand side contains exactly two symbols, which are not variables. Show all steps.

S $\rightarrow$ AB | BA
A $\rightarrow$ 0A | 1B
B $\rightarrow$ 00 | 11