Subjective Questions

Write detailed answers. Adequately explain your assumptions and thought process.

1. [3 points] Prove that regular languages are closed under the dropout operation.

$$Dropout(A) = \{xz \mid xyz \in A, y \in \Sigma \text{ and } x, z \in \Sigma^*\}$$

[CO1, CO2, CO3]

2. [3 points] Find a regular expression for the language recognized by this machine, using the procedure we have studied in class: Show all your work, in particular, the state diagrams after the removal of each successive state. You may omit ϵ-transitions from your diagrams while constructing the GNFA.
[CO1, CO2, CO3]

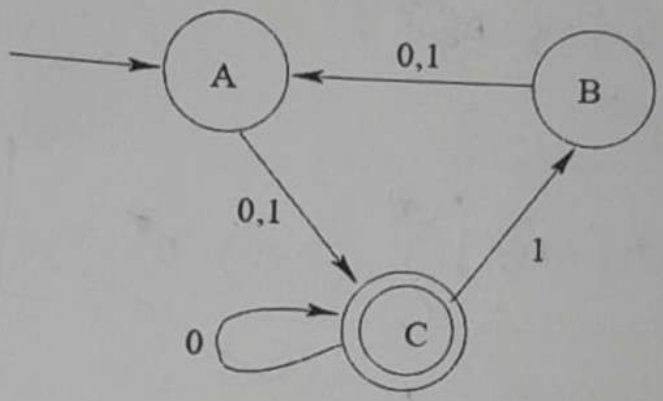

Figure 1: DFA for Question 2

3. [4 points] For the language $L = \{w \in \{0,1\}^* | \ w$ has twice as many 0's as 1's$\}$,

(i) Construct a Context Free Grammar for language L.

(ii) Draw the PDA for this language.

[CO1, CO2, CO3]

4. [5 points] Let $\Sigma = \{0, 1, 2\}$ and

$$L = \{ 0^i 1^j 2^k \mid i, j, k \geq 0, \quad i > j > k \}.$$

Prove that this language is not context-free using the Pumping Lemma for CFLs. [CO1, CO4]