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COS 210 Worksheet 9

- This worksheet consists of **2 questions** for a total of **15 marks**.
- Show your working for all calculations and reasoning.

Question 1 ..... (9 marks)

Convert the context-free grammar G to a non-deterministic pushdown automaton. Where $G = (V, \Sigma, R, S)$, $V = \{S, A, B, C\}$, $\Sigma = \{a, b, c\}$, and R contains

$$S \to AB|\epsilon$$
$$A \to AB|CB|a$$
$$B \to AB|b$$
$$C \to AC|c$$

Question 2 ..... (6 marks)

Complete the construction of the following deterministic pushdown automaton that accepts the language

$$L = \{0^n 1^{2n} \in \{0,1\}^* : n \geq 0\}$$

The automaton is given by $M = (Q, \Sigma, \Gamma, \delta, q_0)$, where $\Sigma = \{0, 1\}$, $\Gamma = \{\$, S\}$, $Q = \{q_0, q_1\}$ and δ by the following instructions. Complete the ride-hand side for each of the given instructions.

$$q_0 0\$ \to$$
$$q_0 0S \to$$
$$q_0 1\$ \to$$
$$q_0 1S \to$$
$$q_0 \square\$ \to$$
$$q_0 \square S \to$$
$$q_1 0\$ \to$$
$$q_1 0S \to$$
$$q_1 1\$ \to$$
$$q_1 1S \to$$
$$q_1 \square\$ \to$$
$$q_1 \square S \to$$