1. (5 points) The following grammar generates the language $\{0^n 1^n \mid n \in \mathbf{N}\}$.

Solution:

$$S \to 0S1 \mid \epsilon$$

2. (5 points) The following grammar generates the language of balanced parentheses.

Solution:

$$P \to (P) \mid PP \mid \epsilon$$

3. (5 points) The following grammar generates the language $\{0^m 1^n \mid m \leq n\}$.

Solution:

$$S \to ZO$$
$$Z \to 0Z1 \mid \epsilon$$
$$O \to 1O \mid \epsilon$$

4. (5 points) The following grammar generates the language of lists over x.

Solution:

$$L \to [I] \mid []$$
$$I \to x, I \mid x$$