Homework 2
EECS 510
2022 Fall

1. (5 points) Give a regular expression for binary strings that do not contain 11 as a substring.

Solution: Start with an optional 1 followed by zero or more copies of 0 or 01.

$$(\epsilon + \mathbf{1})(\mathbf{0} + \mathbf{01})^*$$

Equivalently, start with zero or more copies of 0 or 10 followed by an optional 1.

$$(\mathbf{0} + \mathbf{10})^*(\epsilon + \mathbf{1})$$

2. (5 points) Give a regular expression for binary strings whose number of 0s is divisible by 5.

Solution:

$$(\mathbf{1} + \mathbf{01}^*\mathbf{01}^*\mathbf{01}^*\mathbf{01}^*\mathbf{0})^*$$

Zero or more copies of a single 1 or a string with exactly five 0s.

3. (5 points) Give a brief English language description of the following regular expression $(\mathbf{0}^*\mathbf{1}^*)^*\mathbf{111}(\mathbf{0} + \mathbf{1})^*$.

Solution: Any binary string which contains the substring 111. The prefix $(\mathbf{0}^*\mathbf{1}^*)^*$ and the suffix $(\mathbf{0} + \mathbf{1})^*$ match any binary string.