ECE 4110/5110 Monday, 09/25/23

# Lecture 10: Transient Behavior

Dr. Kevin Tang Handout 11

**Related Reading**

Bertsekas and Tsitsiklis 7.4

**Absorbing Probability**

$$a_i = P(X_n = s \text{ for some } n \mid X_0 = i) \tag{1}$$

$$a_s = 1 \tag{2}$$

$$a_i = 0 \qquad i \text{ is absorbing and } i \text{ is different from } s \tag{3}$$

$$a_i = \sum_{j=1}^{m} p_{ij} a_j \qquad i \text{ is transient} \tag{4}$$

**Expected Time to Absorbing**

$$\mu_i = E(\min(n \geq 0 | X_n \text{ is recurrent}) | X_0 = i) \tag{5}$$

$$\mu_i = 0 \qquad i \text{ is recurrent} \tag{6}$$

$$\mu_i = 1 + \sum_{j=1}^{m} p_{ij} \mu_j \qquad i \text{ is transient} \tag{7}$$

**Expected Time spent in Transient States**

$$t_{ij} = \delta_{i,j} + \sum_{k \text{ is transient}} p_{ik} t_{kj} \tag{8}$$