CS 6300 **HMM Practice** **April 7, 2022**

You are trying to diagnose whether your computer is broken or not. On a given day, your computer's hidden state is either *broken* or *working*. Each day you make one of the following observations: *blue-screen*, *slow*, or *snappy*, depending on the state of your computer. You decide to use the following HMM to model your daily observations:

Initial Distribution

State	$P(X_1)$
working	0.9
broken	0.1

Transition Distribution

State	Next State	$P(X_{t+1}\|X_t)$
working	*working*	0.9
working	*broken*	0.1
broken	*broken*	1.0
broken	*working*	0.0

Emission Distribution

State	Observation	$P(O_t\|X_t)$
working	*snappy*	0.7
working	*slow*	0.2
working	*blue-screen*	0.1
broken	*snappy*	0.1
broken	*slow*	0.4
broken	*blue-screen*	0.5

1. What is the posterior distribution of X_1, your computer's state on day one, given the observation (*slow*) on day 1?

2. What is the posterior distribution of X_2, your computer's state on day two, given the observation sequence (*slow, slow*)?

3. If you observe that your computer is *slow* every day, what is the first day for which the computer is most likely *broken*?