**Question 1:**

Pi = [0.5, 0.5]

A = [[0.5, 0.5], [0.5, 0.5]]

B = [[0.9, 0.1], [0.5, 0.5]]

**Question 2:**

[0, 1] \* [[0.5, 0.5], [0.5, 0.5]] = [0.5, 0.5]

**Question 3:**

[0.5, 0.5] \* [[0.9, 0.1], [0.5, 0.5]] = [0.7, 0.3]

**Question 4:**

Because when we have the condition that the state at time t , the observation at time t is conditionally independent of .

**Question 5:**

The matrix and stores the same values of parameters as the number of states.

**Question 6:**

Di-gamma function is defined as the probability of the hidden states and , given the whole observation sequence. Based on Bayes theorem:

In which