2.1a.

P(O,X = HHH) = 0.0
P(O,X = HHC) = 0.0
P(O,X = HCH) = 0.0
P(O,X = HCC) = 0.0
P(O,X = CHH) = 1.0*0.2*0.4*0.1*0.7*0.5=0.0028
P(O,X = CHC) = 1.0*0.2*0.4*0.1*0.3*0.1=0.00024
P(O,X = CCH) = 1.0*0.2*0.6*0.7*0.4*0.5=0.0168
P(O,X = CCC) = 1.0*0.2*0.6*0.7*0.6*0.1=0.00504

2.1b.

a0(0) = 0.0
a0(1) = 1.0*0.2=.2
a1(0) = (0.0*0.7+0.2*0.4)*0.1=0.008
a1(1) = (0.0*0.3+0.2*0.6)*0.7=0.084
a2(0) = (0.008*0.7+0.084*0.4)*0.5=0.0196
a2(1) = (0.008*0.3+0.084*0.6)*0.1=0.00528

2.1c.
O(N^2T)
O(2TN^T)

2.2a. CCH

2.2b. CCH

2.3 Code on Folder

2.10a. The two hidden states represent vowels and consonants since the HMM will differentiate them into two distinct groups. English words have vowels and consonants as dominant characters so its probabilities are different and the HMM can establish a pattern.

2.10b. The three hidden states represent vowels, frequently used consonants and less frequent consonants. Since characters in English aren’t treated equal the HMM will be able to establish a difference.

2.10c. The four hidden states are vowels, frequent consonants, less frequent and barely used consonants.

2.10d. Now with twenty seven hidden states it is divided with each character and the whitespace since each state has a probability of appearing.

2.11 Code on Folder