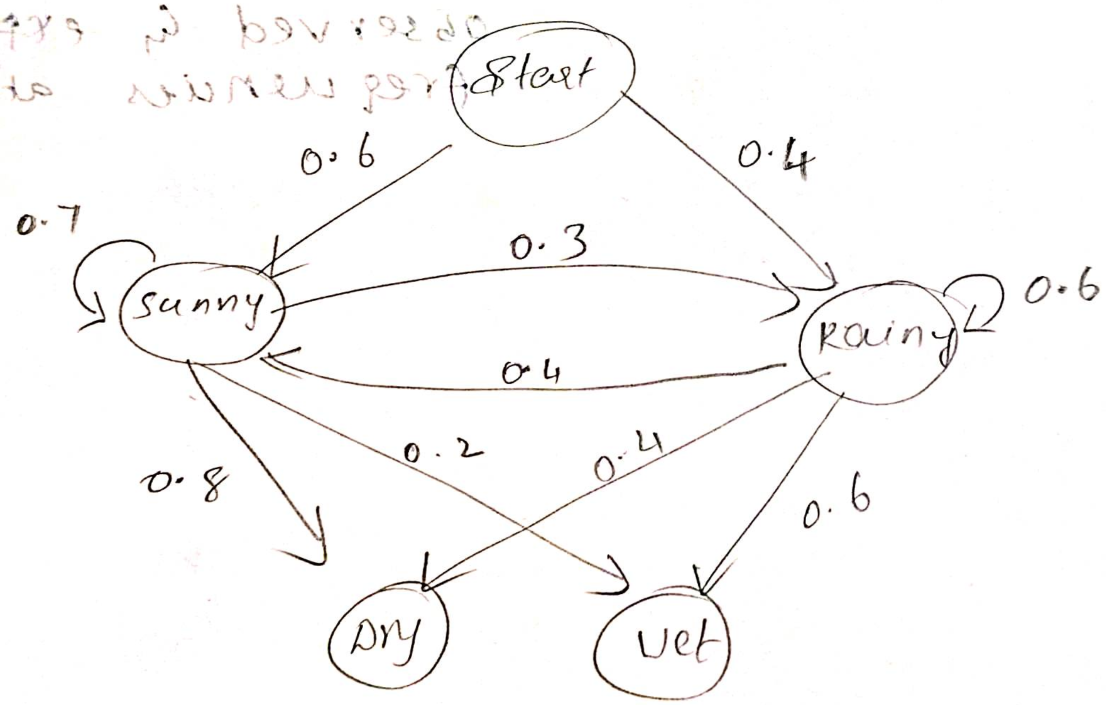
The weather can be described as sunny (S) or Rainy (R). Assume the following probabilities for a Hidden Markov Model. Initial probabilities π = $P(S) = 0.6$, $P(R) = 0.4$.

Transition Probabilities (A) : $P(S \to S) = 0.7$, $P(S \to R) = 0.3$, $P(R \to R) = 0.6$, $P(R \to S) = 0.4$

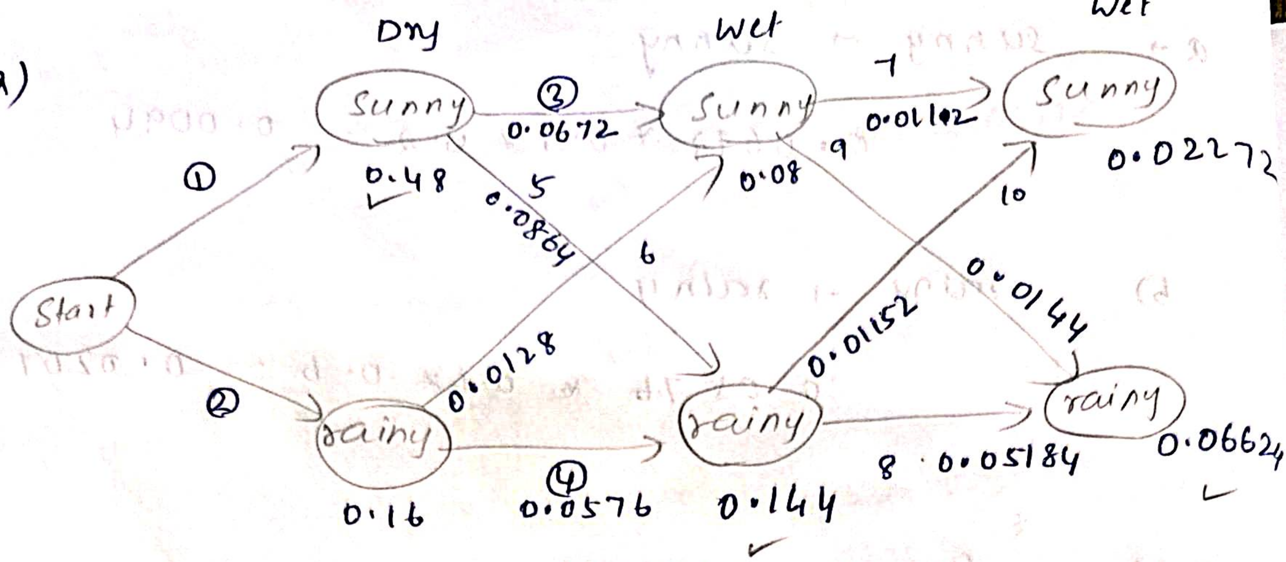
Emission probabilities (B) : Observations are Dry (D) or Wet (W) $P(D|S) = 0.8$, $P(W|S) = 0.2$, $P(D|R) = 0.4$, $P(W|R) = 0.6$



[Dry wet wet]

given sequence,

a)



① → start → sunny

$0.6 * 0.8 = 0.48$

② → start → rainy

$0.4 * 0.4 = 0.16$

③ → sunny → sunny

$0.48 \times 0.7 * 0.2 = 0.0672$

④ → Rainy → Rainy

$0.16 \times 0.6 \times 0.6 = 0.0576$

⑤ sunny → rainy

$0.48 * 0.3 * 0.6 = 0.0864$

⑥ rainy → sunny

$0.16 * 0.4 * 0.2 = 0.0128$

⑦ sunny → sunny

$0.08 \times 0.7 \times 0.2 = 0.0112$,

⑧ rainy → rainy

$0.144 * 0.6 * 0.6 = 0.05184$.

⑨ sunny → rainy

$0.08 \times 0.3 \times 0.6 = 0.0144$

⑩ rainy → sunny

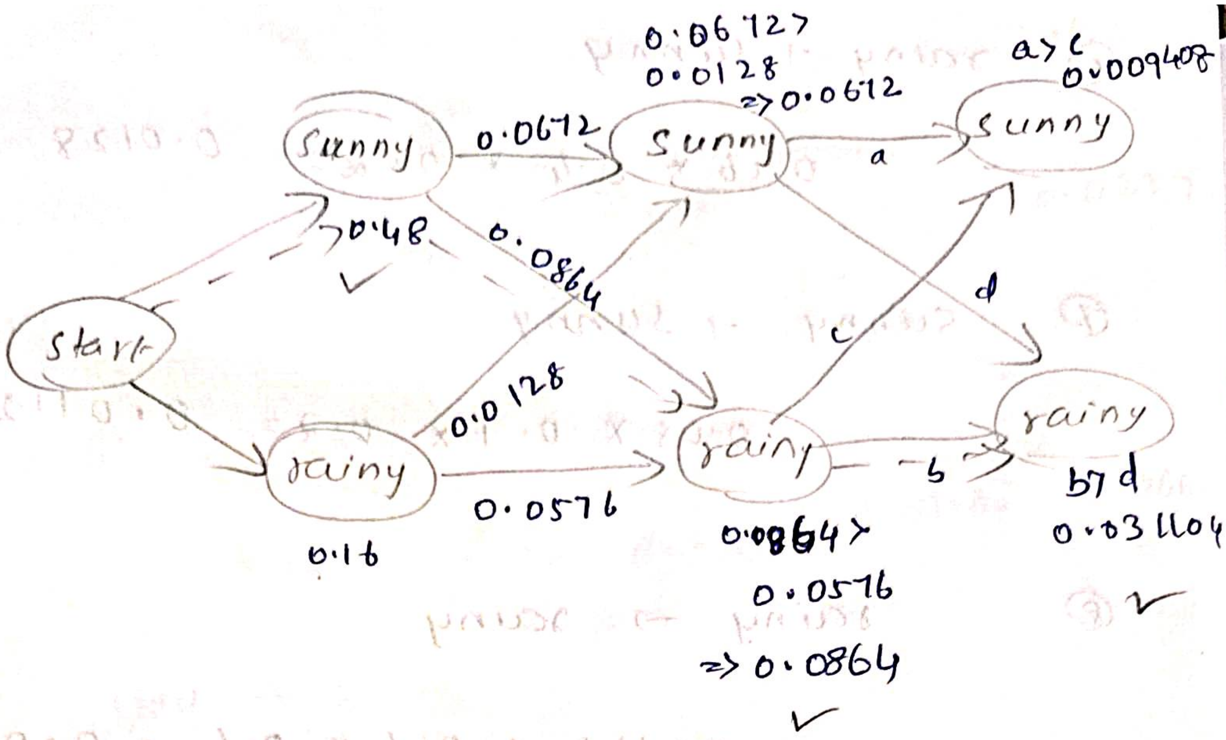
$0.144 * 0.4 * 0.2 = 0.01152$

$\Rightarrow 0.69024$

total probability $= 0.06624 + 0.144 + 0.48$

$= 0.69024$

B)



a) sunny → sunny

$0.0672 \times 0.7 \times 0.2 = 0.009408$

b) rainy → rainy

$0.0864 \times 0.6 \times 0.6 = 0.031104$

c) rainy → sunny

$0.0864 \times 0.4 \times 0.2 = 0.006912$

d) sunny → rainy

$0.0672 \times 0.3 \times 0.6 = 0.012096$

Viterbi sequence = [sunny rainy rainy]

[0.031104 0.0864 0.48]