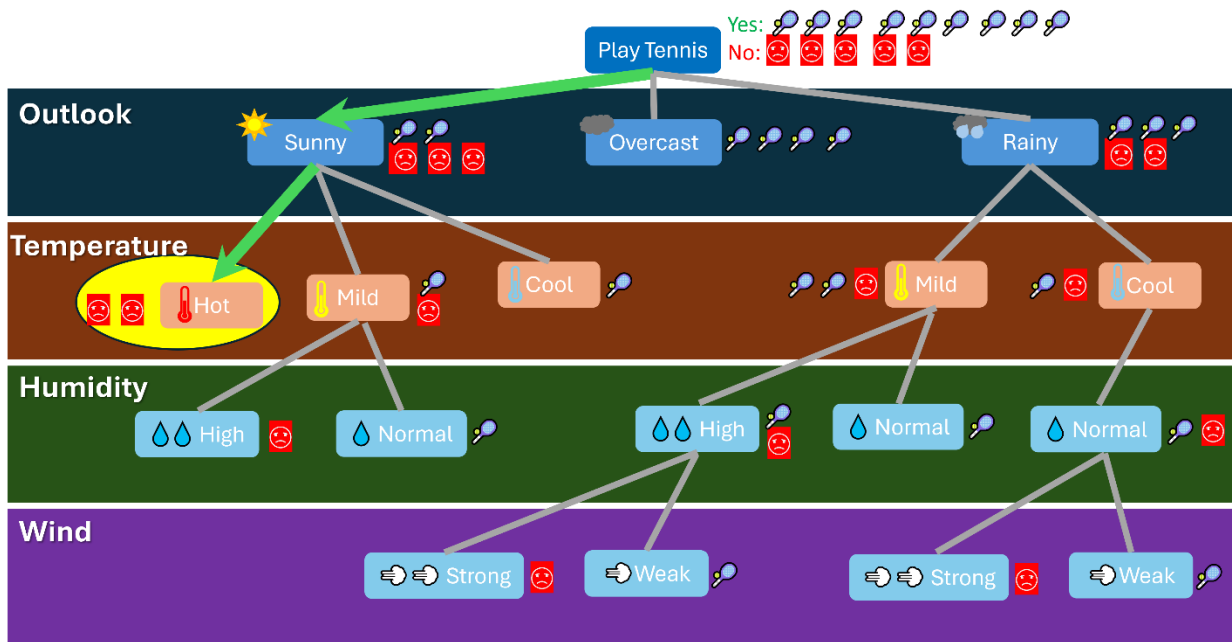


Q 2. a)

Here's the decision tree for the given dataset. (Diagram drawn in MS PowerPoint)



Therefore, according to the conditions of D15 {Sunny, Hot, High, Weak}, the class assigned = **No**

The tree is constructed by choosing the correct attribute at each node so that information gain is maximized (Entropy minimized) at every node.

Q 2.b)

Step 1: Calculate Probabilities of Label column (PlayTennis: Yes or no)

1. $P(\text{PlayTennis} = \text{Yes}) = 9 / 14$
2. $P(\text{PlayTennis} = \text{No}) = 5 / 14$

Step 2: Calculate Conditional Probabilities for D15 {Sunny, Hot, High, Weak}

3. $P(\text{Outlook} = \text{Sunny} \mid \text{PlayTennis} = \text{Yes}) = 2 / 9$
4. $P(\text{Outlook} = \text{Sunny} \mid \text{PlayTennis} = \text{No}) = 3 / 5$
5. $P(\text{Temperature} = \text{Hot} \mid \text{PlayTennis} = \text{Yes}) = 2 / 9$
6. $P(\text{Temperature} = \text{Hot} \mid \text{PlayTennis} = \text{No}) = 2 / 5$
7. $P(\text{Humidity} = \text{High} \mid \text{PlayTennis} = \text{Yes}) = 3 / 9$
8. $P(\text{Humidity} = \text{High} \mid \text{PlayTennis} = \text{No}) = 3 / 5$
9. $P(\text{Wind} = \text{Weak} \mid \text{PlayTennis} = \text{Yes}) = 6 / 9$
10. $P(\text{Wind} = \text{Weak} \mid \text{PlayTennis} = \text{No}) = 2 / 5$

Step 3: Calculate Conditional Probabilities of Play Tennis or not, given the conditions of D15 {Sunny, Hot, High, Weak}:

11. **$P(\text{PlayTennis} = \text{Yes} \mid \text{D15})$** = $P(\text{PlayTennis} = \text{Yes}) * P(\text{Outlook} = \text{Sunny} \mid \text{PlayTennis} = \text{Yes}) * P(\text{Temperature} = \text{Hot} \mid \text{PlayTennis} = \text{Yes}) * P(\text{Humidity} = \text{High} \mid \text{PlayTennis} = \text{Yes}) * P(\text{Wind} = \text{Weak} \mid \text{PlayTennis} = \text{Yes}) = (9/14) * (2/9) * (2/9) * (3/9) * (6/9) = 0.0114$
12. **$P(\text{PlayTennis} = \text{No} \mid \text{D15})$** = $P(\text{PlayTennis} = \text{No}) * P(\text{Outlook} = \text{Sunny} \mid \text{PlayTennis} = \text{No}) * P(\text{Temperature} = \text{Hot} \mid \text{PlayTennis} = \text{No}) * P(\text{Humidity} = \text{High} \mid \text{PlayTennis} = \text{No}) * P(\text{Wind} = \text{Weak} \mid \text{PlayTennis} = \text{No}) = (5/14) * (3/5) * (2/5) * (3/5) * (2/5) = 0.0206$

Step 3: Prediction: No

Since $P(\text{PlayTennis} = \text{No} \mid \text{D15}) = 0.0206 > P(\text{PlayTennis} = \text{Yes} \mid \text{D15}) = 0.0114$, the Naive Bayes classifier for PlayTennis, given the conditions of D15 {Sunny, Hot, High, Weak} assigns **No**.