1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

**FIND-S Algorithm**

1. Initialize $h$ to the most specific hypothesis in $H$

2. For each positive training instance $x$
   
   For each attribute constraint $a_i$ in $h$
   
   If the constraint $a_i$ is satisfied by $x$
   
   Then do nothing
   
   Else replace $a_i$ in $h$ by the next more general constraint that is satisfied by $x$

3. Output hypothesis $h$

**Training Examples:**

<table>
<thead>
<tr>
<th>Example</th>
<th>Sky</th>
<th>AirTemp</th>
<th>Humidity</th>
<th>Wind</th>
<th>Water</th>
<th>Forecast</th>
<th>EnjoySport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sunny</td>
<td>Warm</td>
<td>Normal</td>
<td>Strong</td>
<td>Warm</td>
<td>Same</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Sunny</td>
<td>Warm</td>
<td>High</td>
<td>Strong</td>
<td>Warm</td>
<td>Same</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Rainy</td>
<td>Cold</td>
<td>High</td>
<td>Strong</td>
<td>Warm</td>
<td>Change</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Sunny</td>
<td>Warm</td>
<td>High</td>
<td>Strong</td>
<td>Cool</td>
<td>Change</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Program:**

```python
import csv

num_attributes = 6
a = []
print("\n The Given Training Data Set \n")

with open('enjoysport.csv', 'r') as csvfile:
    reader = csv.reader(csvfile)
    for row in reader:
        a.append (row)
        print(row)

print("\n The initial value of hypothesis: ")
hypothesis = ['0'] * num_attributes
print(hypothesis)

for j in range(0,num_attributes):
    hypothesis[j] = a[0][j];

print("\n Find S: Finding a Maximally Specific Hypothesis\n")

for i in range(0,len(a)):
    if a[i][num_attributes]=='yes':
        for j in range(0,num_attributes):
            if a[i][j]!=hypothesis[j]:
                hypothesis[j]='?'
            else :
                hypothesis[j] = a[i][j]
        print(" For Training instance No:{0} the hypothesis is ".format(i),hypothesis)

print("\n The Maximally Specific Hypothesis for a given Training Examples :\n")
print(hypothesis)
```
Data Set:

<table>
<thead>
<tr>
<th>sunny</th>
<th>warm</th>
<th>normal</th>
<th>strong</th>
<th>warm</th>
<th>same</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>sunny</td>
<td>warm</td>
<td>high</td>
<td>strong</td>
<td>warm</td>
<td>same</td>
<td>yes</td>
</tr>
<tr>
<td>rainy</td>
<td>cold</td>
<td>high</td>
<td>strong</td>
<td>warm</td>
<td>change</td>
<td>no</td>
</tr>
<tr>
<td>sunny</td>
<td>warm</td>
<td>high</td>
<td>strong</td>
<td>cool</td>
<td>change</td>
<td>yes</td>
</tr>
</tbody>
</table>

Output:

The Given Training Data Set

['sunny', 'warm', 'normal', 'strong', 'warm', 'same', 'yes']
['sunny', 'warm', 'high', 'strong', 'warm', 'same', 'yes']
['rainy', 'cold', 'high', 'strong', 'warm', 'change', 'no']
['sunny', 'warm', 'high', 'strong', 'cool', 'change', 'yes']

The initial value of hypothesis:
['0', '0', '0', '0', '0', '0']

Find S: Finding a Maximally Specific Hypothesis

For Training Example No:0 the hypothesis is
['sunny', 'warm', 'normal', 'strong', 'warm', 'same']

For Training Example No:1 the hypothesis is
['sunny', 'warm', '?', 'strong', 'warm', 'same']

For Training Example No:2 the hypothesis is
'sunny', 'warm', '?', 'strong', 'warm', 'same']

For Training Example No:3 the hypothesis is
'sunny', 'warm', '?', 'strong', '?', '?'

The Maximally Specific Hypothesis for a given Training Examples:
['sunny', 'warm', '?', 'strong', '?', '?']