EX 3

CODING:

```python
import math

data = [
    ['Sunny','Hot','High','Weak','No'],
    ['Sunny','Hot','High','Strong','No'],
    ['Overcast','Hot','High','Weak','Yes'],
    ['Rain','Mild','High','Weak','Yes'],
    ['Rain','Cool','Normal','Weak','Yes'],
    ['Rain','Cool','Normal','Strong','No']
]

attrs = ['Outlook','Temp','Humidity','Wind']

def ent(d):
    y = sum(1 for r in d if r[-1]=='Yes')
    n = len(d)-y
    if y==0 or n==0: return 0
    return -(y/len(d))*math.log2(y/len(d))-(n/len(d))*math.log2(n/len(d))

def gain(d,i):
    return ent(d)-sum(len([r for r in d if r[i]==v])/len(d)*ent([r for r in d if r[i]==v]) for v in set(r[i] for r in d))

def id3(d,a):
    l=[r[-1] for r in d]
    if l.count(l[0])==len(l): return l[0]
    i=max(range(len(a)),key=lambda x:gain(d,x))
    t={a[i]:{}}
    for v in set(r[i] for r in d):
```

```
        t[a[i]][v]=id3([r[:i]+r[i+1:] for r in d if r[i]==v],a[:i]+a[i+1:])

    return t


tree=id3(data,attrs)

print("Tree:",tree)


sample=['Sunny','Cool','High','Strong']


def test(t,a,s):

    return t if type(t)==str else test(t[list(t)[0]][s[a.index(list(t)[0])]],a,s)


print("Result:",test(tree,attrs,sample))
```

OUTPUT:


```
main.py

1  import math
2  data = [
3    ['Sunny','Hot','High','Weak','No'],
4    ['Sunny','Hot','High','Strong','No'],
5    ['Overcast','Hot','High','Weak','Yes'],
6    ['Rain','Mild','High','Weak','Yes'],
7    ['Rain','Cool','Normal','Weak','Yes'],
8    ['Rain','Cool','Normal','Strong','No']
9  ]
10 attrs = ['Outlook','Temp','Humidity','Wind']
11 def ent(d):
12   y = sum(1 for r in d if r[-1]=='Yes')
13   n = len(d)-y
14   if y==0 or n==0: return 0
15   return -(y/len(d))*math.log2(y/len(d))-(n/len(d))*math.log2(n/len(d))
16 def gain(d,i):
17   return ent(d)-sum(len([r for r in d if r[i]==v])/len(d)*ent([r for r in d if r[i]==v]) for v in
        set(r[i] for r in d))
18 def id3(d,a):
19   l=[r[-1] for r in d]
20   if l.count(l[0])==len(l): return l[0]
21   i=max(range(len(a)),key=lambda x:gain(d,x))
22   t={a[i]:{}}
23   for v in set(r[i] for r in d):
24    t[a[i]][v]=id3([r[:i]+r[i+1:] for r in d if r[i]==v],a[:i]+a[i+1:])
25   return t
26 tree=id3(data,attrs)
27 print("Tree:",tree)
28 sample=['Sunny','Cool','High','Strong']
29 def test(t,a,s):
30   return t if type(t)==str else test(t[list(t)[0]][s[a.index(list(t)[0])]],a,s)
31 print("Result:",test(tree,attrs,sample))
32
```

Output

```
Tree: {'Outlook': {'Sunny': 'No', 'Overcast': 'Yes', 'Rain': {'Wind': {'Strong': 'No', 'Weak': 'Yes'}}}}
Result: No

=== Code Execution Successful ===
```