HABERMANS DATASET ASSIGNMENT

Description of dataset-:

1. AGE - Age of patient
2. YOP - Year of operation
3. POS_NODES - No. of positive auxillary nodes found
4. STATUS-: 1= Patient survived for 5 or more years, 2= Patient died within 5 years.

In [4]:

```
import pandas as p
x=['AGE','YOP','POS_NODES','STATUS']
a=p.read_csv('haberman.csv',names=x)
print(a.head())
```

```
   AGE  YOP  POS_NODES  STATUS
0   30   64          1       1
1   30   62          3       1
2   30   65          0       1
3   31   59          2       1
4   31   65          4       1
```

In [7]:

```
print(a.shape)
```

```
(306, 4)
```

-> There are 306 datapoints and 4 features.

In [8]:

```
print(a.columns)
```

```
Index(['AGE', 'YOP', 'POS_NODES', 'STATUS'], dtype='object')
```

-> These are the column name in the dataset.

In [9]:

```
print(a['STATUS'].value_counts())
```

```
1    225
2     81
Name: STATUS, dtype: int64
```

-> There are 2 classes:'1' and '2' -> Datapoints present for class '1' : 225 -> Datapoints present for class '2' : 81

OBSERVATION

1. The dataset is classified into two classes i.e 225 patients of class 1, those who survived for more than 5 years,81 patients of class 2, those who not survived for more than 5 years.
2. This dataset is an imbalanced dataset as there is huge margin between the datapoints of class-1 and class-2.

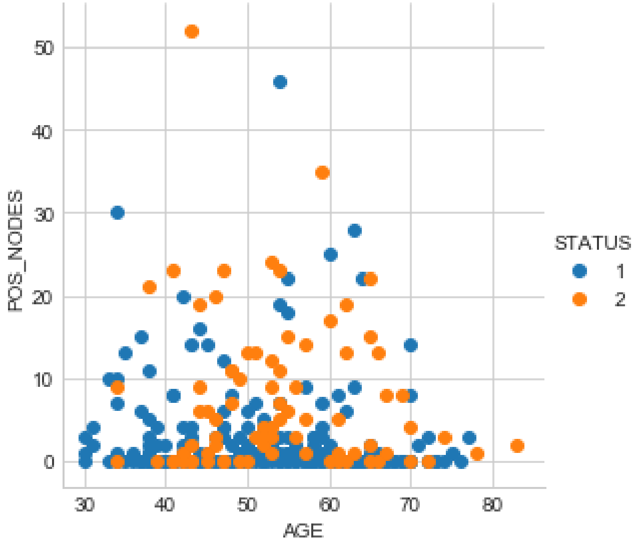
OBJECTIVE

Given a persons age,positive nodes and year of operation we have to find whether that person lies in class-1 or class-2.

2-D SCATTER PLOT

In [14]:

```
import seaborn as sea
import matplotlib.pyplot as plt
sea.set_style("whitegrid")
sea.FacetGrid(a,hue="STATUS",size=4) \
   .map(plt.scatter,'AGE','POS_NODES') \
    .add_legend()
plt.show()
```



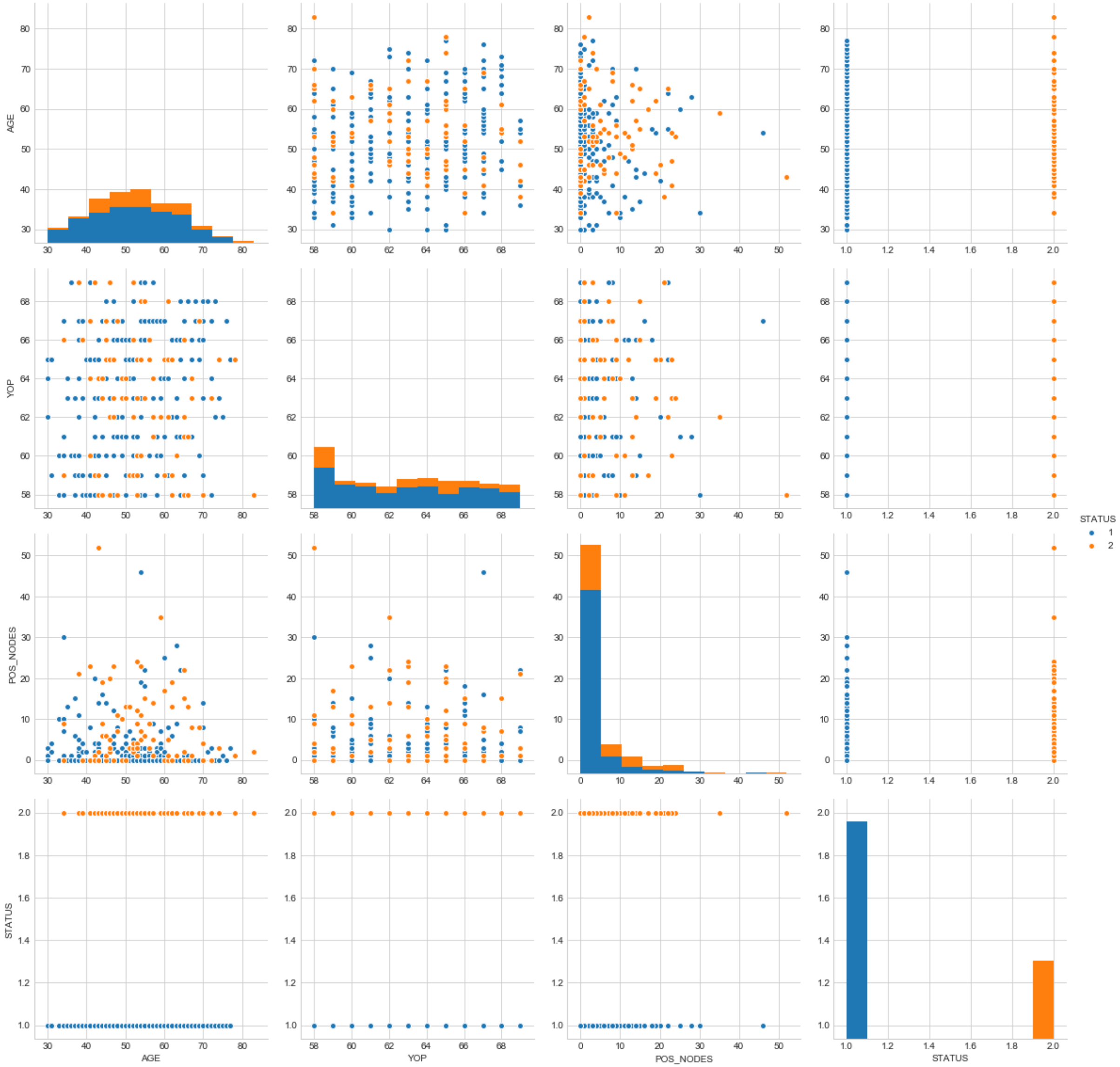
OBSERVATIONS-:

1. Using age and no. of positive axillary nodes as features, we cannot make any difference since both are overlapping each other.
2. Most of the people have 0 positive auxillary node.

PAIR-PLOT

In [23]:

```
plt.close()
sea.set_style("whitegrid")
sea.pairplot(a,hue="STATUS",size=4)
plt.show()
```



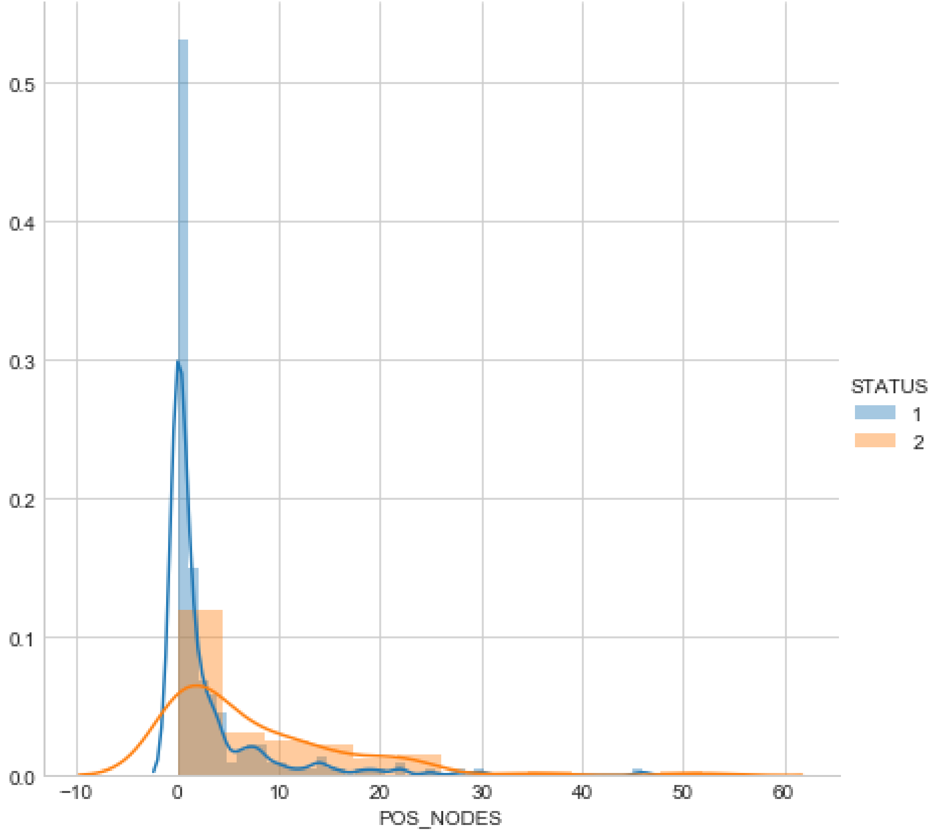
OBSERVATION-:

1. There are no two features through which we can easily distinguish between class-1 and

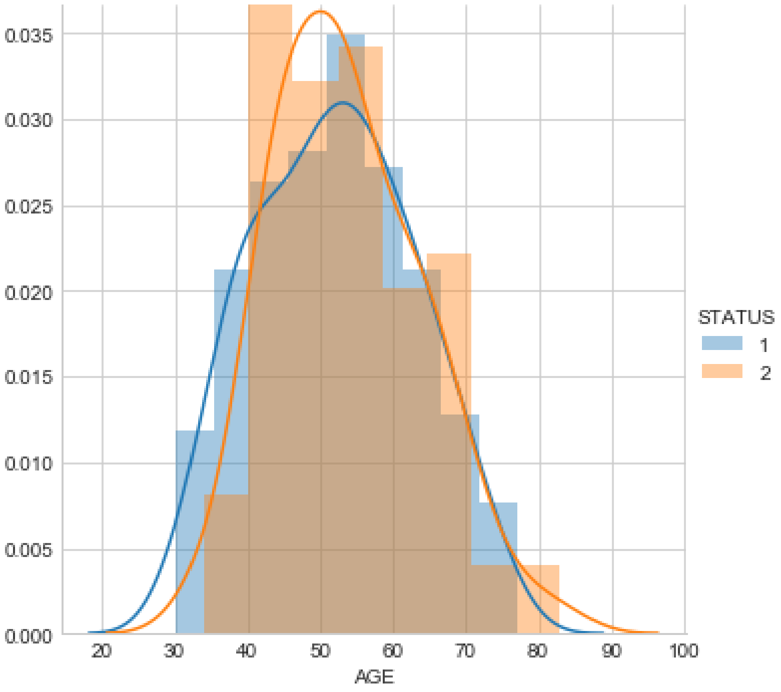
class-2.

HISTOGRAM AND PDF

In [25]:
```
sea.FacetGrid(a,hue='STATUS',size=6) \
    .map(sea.distplot,'POS_NODES') \
    .add_legend()
plt.show()
```

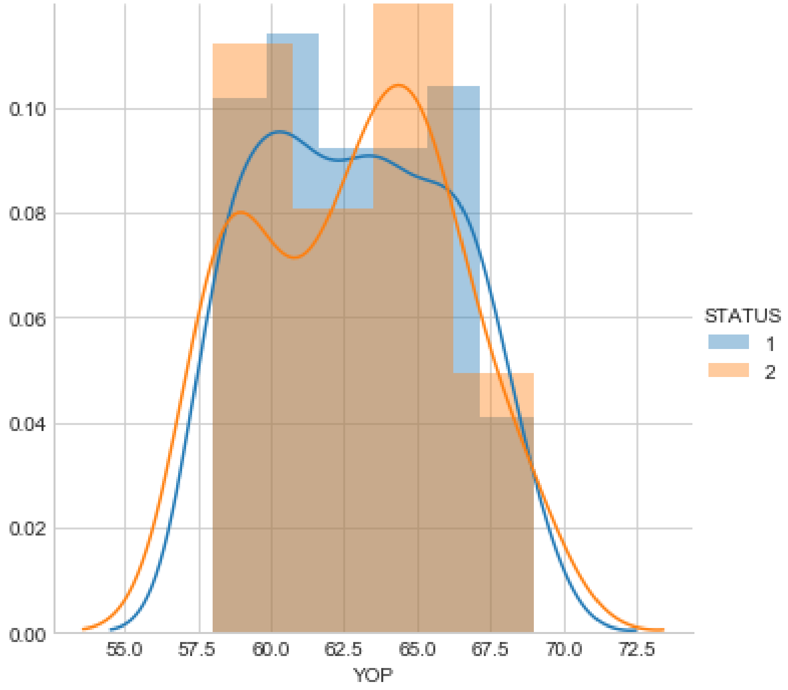


In [26]:
```
sea.FacetGrid(a,hue='STATUS',size=5) \
    .map(sea.distplot,'AGE') \
    .add_legend()
plt.show()
```



In [27]:

```
sea.FacetGrid(a,hue='STATUS',size=5) \
    .map(sea.distplot,'YOP') \
    .add_legend()
plt.show()
```



As the distribution for class-1 and class-2 overlaps in huge amount, so we will go for the mean.

In [43]:

```
import numpy as np
a1= a.loc[a['STATUS']==1];
a2= a.loc[a["STATUS"]==2];
print("MEANS-:")
print(".FOR AGE")
print(round(np.mean(a1["AGE"])))
print(round(np.mean(a2["AGE"])))
print("----------------")
print(".FOR POS_NODES")
print(round(np.mean(a1["POS_NODES"])))
print(round(np.mean(a2["POS_NODES"])))
print("----------------")
print(".FOR YOP")
print(round(np.mean(a1["YOP"])))
print(round(np.mean(a1["YOP"])))
```

```
MEANS-:
.FOR AGE
52
54
---------------
.FOR POS_NODES
3
7
---------------
.FOR YOP
63
63
```

OBSERVATION-:

1. Of the three features POS_NODES is a very important feature in identifying the class as the difference between the means are more as compared to others.
2. Most of the people that have 0 POS_NODES have survived.
3. The mean positive auxillary nodes for the person that survived are 3 as compared to 7 which have not survived.
4. The mean age of the patients which survived is 52 years and not survived is 54 years.

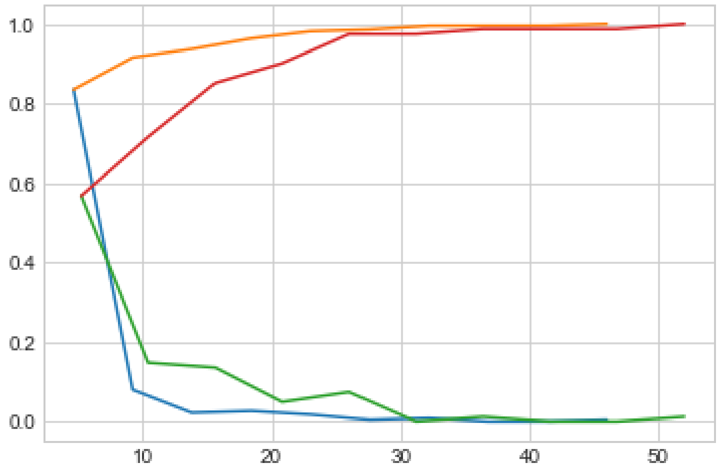
CDF

In [75]:

```python
counts, bin_edges = np.histogram(a1['POS_NODES'], bins=10,
                                 density = True)
pdf = counts/(sum(counts))
print(pdf);
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:], cdf)
#plt.show()
counts, bin_edges = np.histogram(a2['POS_NODES'], bins=10,
                                 density = True)
pdf = counts/(sum(counts))
print(pdf);
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:], cdf)

plt.show()
```

```
[ 0.83555556  0.08        0.02222222  0.02666667  0.01777778  0.0044444
4
  0.00888889  0.          0.          0.00444444]
[  0.    4.6   9.2  13.8  18.4  23.   27.6  32.2  36.8  41.4  46. ]
[ 0.56790123  0.14814815  0.13580247  0.04938272  0.07407407  0.
  0.01234568  0.          0.          0.01234568]
[  0.    5.2  10.4  15.6  20.8  26.   31.2  36.4  41.6  46.8  52. ]
```



OBSERVATION-:

1. If the positive auxillary nodes are more than 46 then the person definately comes under the class-2.

2. If the no. of positive auxillary nodes lies between 0-24 then there are 82%-98% chances of survival whereas the non-survival ranges from 59% to 84%.

STATISTICAL DESCRIPTION

In [76]:

```
a1.describe()
```

Out[76]:

	AGE	YOP	POS_NODES	STATUS
count	225.000000	225.000000	225.000000	225.0
mean	52.017778	62.862222	2.791111	1.0
std	11.012154	3.222915	5.870318	0.0
min	30.000000	58.000000	0.000000	1.0
25%	43.000000	60.000000	0.000000	1.0
50%	52.000000	63.000000	0.000000	1.0
75%	60.000000	66.000000	3.000000	1.0
max	77.000000	69.000000	46.000000	1.0

In [77]:

```
a2.describe()
```

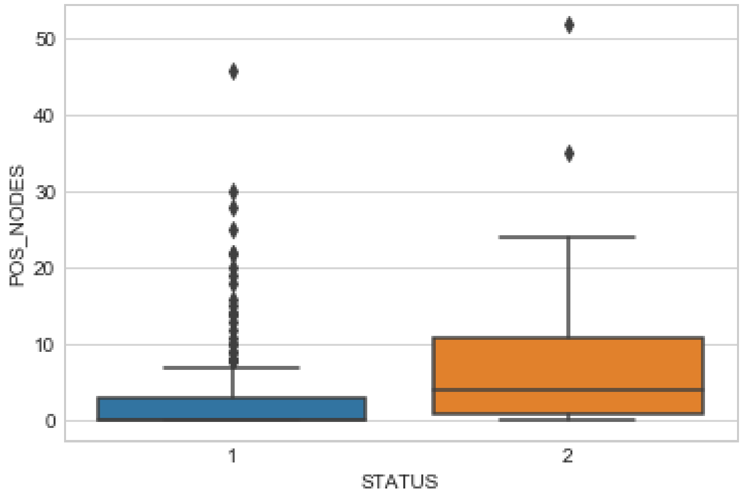
Out[77]:

	AGE	YOP	POS_NODES	STATUS
count	81.000000	81.000000	81.000000	81.0
mean	53.679012	62.827160	7.456790	2.0
std	10.167137	3.342118	9.185654	0.0
min	34.000000	58.000000	0.000000	2.0
25%	46.000000	59.000000	1.000000	2.0

	AGE	YOP	POS_NODES	STATUS
50%	53.000000	63.000000	4.000000	2.0
75%	61.000000	65.000000	11.000000	2.0
max	83.000000	69.000000	52.000000	2.0

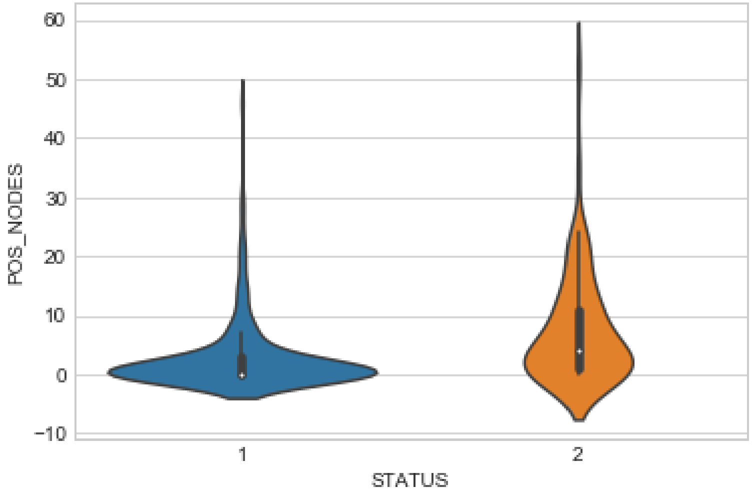
BOX PLOT

```
In [81]: sea.boxplot(y='POS_NODES',x='STATUS',data=a)
         plt.show()
```



VIOLIN PLOT

```
In [82]: sea.violinplot(x='STATUS',y='POS_NODES',data=a,size=8)
         plt.show()
```



OBSERVATION-:

1. The Plots tells us that 50% of points in class-2 are having auxillary nodes less than 5.
2. 75% of points in class-1 are having auxillary nodes less than 5.
3. The plot also tells us that if the value of positive auxillary nodes are greater than 7 then the patient will not survive.