In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:

```
df=pd.read_csv('iono.csv')
df
```

Out[3]:

-0.05889	0.85243	0.02306	0.83398	-0.37708	1.1	0.0376	...	-0.51171	0.41078	-0.46168	0.21266
-0.18829	0.93035	-0.36156	-0.10868	-0.93597	1.00000	-0.04549	...	-0.26569	-0.20468	-0.18401	-0.19040
-0.03365	1.00000	0.00485	1.00000	-0.12062	0.88965	0.01198	...	-0.40220	0.58984	-0.22145	0.43100
-0.45161	1.00000	1.00000	0.71216	-1.00000	0.00000	0.00000	...	0.90695	0.51613	1.00000	1.00000
-0.02401	0.94140	0.06531	0.92106	-0.23255	0.77152	-0.16399	...	-0.65158	0.13290	-0.53206	0.02431
-0.00592	-0.09924	-0.11949	-0.00763	-0.11824	0.14706	0.06637	...	-0.01535	-0.03240	0.09223	-0.07859
...	...	...	...	...	...	...	...	...	...	...	...
0.08298	0.73739	-0.14706	0.84349	-0.05567	0.90441	-0.04622	...	-0.04202	0.83479	0.00123	1.00000
0.00419	0.95183	-0.02723	0.93438	-0.01920	0.94590	0.01606	...	0.01361	0.93522	0.04925	0.93159
-0.00034	0.93207	-0.03227	0.95177	-0.03431	0.95584	0.02446	...	0.03193	0.92489	0.02542	0.92120
-0.01657	0.98122	-0.01989	0.95691	-0.03646	0.85746	0.00110	...	-0.02099	0.89147	-0.07760	0.82983
0.13533	0.73638	-0.06151	0.87873	0.08260	0.88928	-0.09139	...	-0.15114	0.81147	-0.04822	0.78207

nns

In [8]:

```
df['g'].value_counts()
```

Out[8]:

```
g    224
b    126
Name: g, dtype: int64
```

In [9]:

```
x=df.drop('g',axis=1)
y=df['g']
```

In [10]:

```
d={"g":{'g':1,'b':2}}
df=df.replace(d)
print(df)
```

```
     1  0  0.99539  -0.05889  0.85243  0.02306  0.83398  -0.37708      1.1  \
0    1  0  1.00000  -0.18829  0.93035 -0.36156 -0.10868  -0.93597  1.00000
1    1  0  1.00000  -0.03365  1.00000  0.00485  1.00000  -0.12062  0.88965
2    1  0  1.00000  -0.45161  1.00000  1.00000  0.71216  -1.00000  0.00000
3    1  0  1.00000  -0.02401  0.94140  0.06531  0.92106  -0.23255  0.77152
4    1  0  0.02337  -0.00592 -0.09924 -0.11949 -0.00763  -0.11824  0.14706
..  .. ..      ...       ...      ...      ...      ...       ...      ...
345  1  0  0.83508   0.08298  0.73739 -0.14706  0.84349  -0.05567  0.90441
346  1  0  0.95113   0.00419  0.95183 -0.02723  0.93438  -0.01920  0.94590
347  1  0  0.94701  -0.00034  0.93207 -0.03227  0.95177  -0.03431  0.95584
348  1  0  0.90608  -0.01657  0.98122 -0.01989  0.95691  -0.03646  0.85746
349  1  0  0.84710   0.13533  0.73638 -0.06151  0.87873   0.08260  0.88928

      0.0376  ...  -0.51171  0.41078  -0.46168  0.21266  -0.3409  0.42267  \
0   -0.04549  ...  -0.26569 -0.20468  -0.18401 -0.19040 -0.11593 -0.16626
1    0.01198  ...  -0.40220  0.58984  -0.22145  0.43100 -0.17365  0.60436
2    0.00000  ...   0.90695  0.51613   1.00000  1.00000 -0.20099  0.25682
3   -0.16399  ...  -0.65158  0.13290  -0.53206  0.02431 -0.62197 -0.05707
4    0.06637  ...  -0.01535 -0.03240   0.09223 -0.07859  0.00732  0.00000
..       ...  ...       ...      ...       ...      ...      ...      ...
345 -0.04622  ...  -0.04202  0.83479   0.00123  1.00000  0.12815  0.86660
346  0.01606  ...   0.01361  0.93522   0.04925  0.93159  0.08168  0.94066
347  0.02446  ...   0.03193  0.92489   0.02542  0.92120  0.02242  0.92459
348  0.00110  ...  -0.02099  0.89147  -0.07760  0.82983 -0.17238  0.96022
349 -0.09139  ...  -0.15114  0.81147  -0.04822  0.78207 -0.00703  0.75747

     -0.54487  0.18641   -0.453  g
0    -0.06288 -0.13738 -0.02447  2
1    -0.24180  0.56045 -0.38238  1
2     1.00000 -0.32382  1.00000  2
3    -0.59573 -0.04608 -0.65697  1
4     0.00000 -0.00039  0.12011  2
..        ...      ...      ... ..
345  -0.10714  0.90546 -0.04307  1
346  -0.00035  0.91483  0.04712  1
347   0.00442  0.92697 -0.00577  1
348  -0.03757  0.87403 -0.16243  1
349  -0.06678  0.85764 -0.06151  1

[350 rows x 35 columns]
```

In [23]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.70)
```

In [26]:

```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[26]:

```
RandomForestClassifier()
```

Depth of Tree

In [27]:

```
parameters={"max_depth":[1,2,3,4,5],"min_samples_leaf":[5,23,45,76,78],'n_estimators':[10,23,45,65,7]
```

Cross Validate

In [35]:

```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="accuracy")
grid_search.fit(x_train,y_train)
```

Out[35]:

```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [1, 2, 3, 4, 5],
                         'min_samples_leaf': [5, 23, 45, 76, 78],
                         'n_estimators': [10, 23, 45, 65, 7]},
             scoring='accuracy')
```

Score

In [36]:

```
grid_search.best_score_
```

Out[36]:

```
0.9262295081967213
```

In [41]:

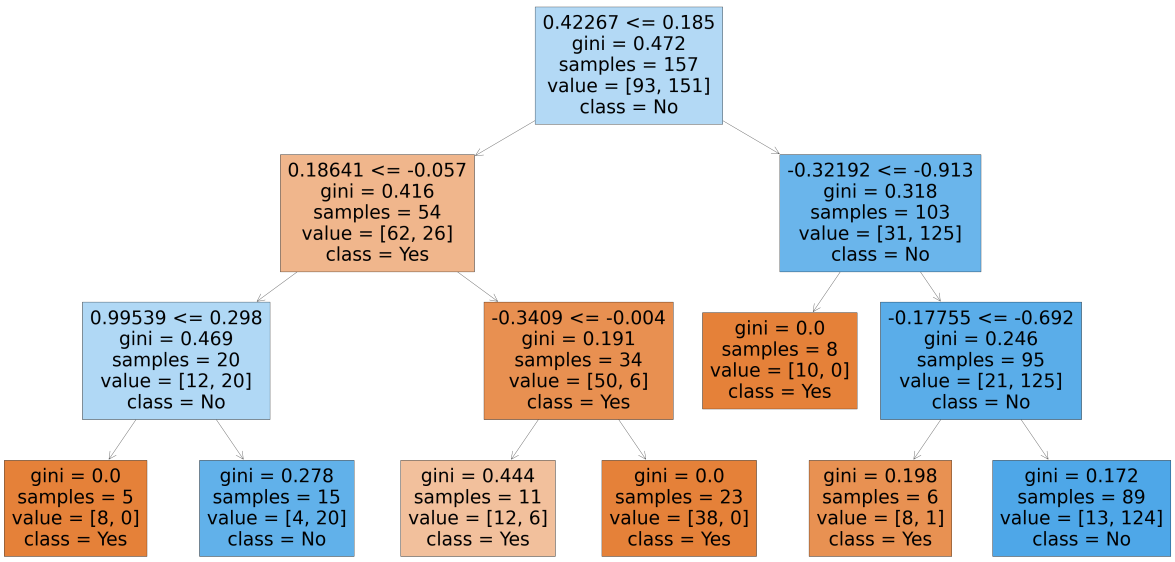
```
rfc_best=grid_search.best_estimator_
```

In [43]:

```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rfc_best.estimators_[5],feature_names=x.columns,class_names=['Yes','No'],filled=True)
```

Out[43]:

```
[Text(2418.0, 1902.6000000000001, '0.42267 <= 0.185\ngini = 0.472\nsamples = 157\nvalue
= [93, 151]\nclass = No'),
 Text(1488.0, 1359.0, '0.18641 <= -0.057\ngini = 0.416\nsamples = 54\nvalue = [62, 26]
\nclass = Yes'),
 Text(744.0, 815.4000000000001, '0.99539 <= 0.298\ngini = 0.469\nsamples = 20\nvalue =
[12, 20]\nclass = No'),
 Text(372.0, 271.79999999999995, 'gini = 0.0\nsamples = 5\nvalue = [8, 0]\nclass = Ye
s'),
 Text(1116.0, 271.79999999999995, 'gini = 0.278\nsamples = 15\nvalue = [4, 20]\nclass =
No'),
 Text(2232.0, 815.4000000000001, '-0.3409 <= -0.004\ngini = 0.191\nsamples = 34\nvalue
= [50, 6]\nclass = Yes'),
 Text(1860.0, 271.79999999999995, 'gini = 0.444\nsamples = 11\nvalue = [12, 6]\nclass =
Yes'),
 Text(2604.0, 271.79999999999995, 'gini = 0.0\nsamples = 23\nvalue = [38, 0]\nclass = Y
es'),
 Text(3348.0, 1359.0, '-0.32192 <= -0.913\ngini = 0.318\nsamples = 103\nvalue = [31, 12
5]\nclass = No'),
 Text(2976.0, 815.4000000000001, 'gini = 0.0\nsamples = 8\nvalue = [10, 0]\nclass = Ye
s'),
 Text(3720.0, 815.4000000000001, '-0.17755 <= -0.692\ngini = 0.246\nsamples = 95\nvalue
= [21, 125]\nclass = No'),
 Text(3348.0, 271.79999999999995, 'gini = 0.198\nsamples = 6\nvalue = [8, 1]\nclass = Y
es'),
 Text(4092.0, 271.79999999999995, 'gini = 0.172\nsamples = 89\nvalue = [13, 124]\nclass
= No')]
```



In [ ]: