In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
df=pd.read_csv(r"C:\Users\Niranjan\Downloads\loan1.csv")
df
```

Out[2]:

	Home Owner	Marital Status	Annual Income	Defaulted Borrower
0	Yes	Single	125	No
1	No	Married	100	No
2	No	Single	70	No
3	Yes	Married	120	No
4	No	Divorced	95	Yes
5	No	Married	60	No
6	Yes	Divorced	220	No
7	No	Single	85	Yes
8	No	Married	75	No
9	No	Single	90	Yes

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   Home Owner          10 non-null     object
 1   Marital Status      10 non-null     object
 2   Annual Income       10 non-null     int64 
 3   Defaulted Borrower  10 non-null     object
dtypes: int64(1), object(3)
memory usage: 452.0+ bytes
```

In [4]:
```
x=df.drop('Defaulted Borrower',axis=1)
y=df['Defaulted Borrower']
```

In [5]:
```
df['Marital Status'].value_counts()
```

Out[5]:
```
Marital Status
Single      4
Married     4
Divorced    2
Name: count, dtype: int64
```

In [6]:
```
HO={"Home Owner":{'Yes':1,'No':0}}
df=df.replace(HO)
print(df)
```

```
   Home Owner Marital Status  Annual Income Defaulted Borrower
0           1         Single            125                 No
1           0        Married            100                 No
2           0         Single             70                 No
3           1        Married            120                 No
4           0       Divorced             95                Yes
5           0        Married             60                 No
6           1       Divorced            220                 No
7           0         Single             85                Yes
8           0        Married             75                 No
9           0         Single             90                Yes
```

In [7]:
```
MS={"Marital Status":{'Single':1,'Married':2,'Divorced':3}}
df=df.replace(MS)
print(df)
```

```
   Home Owner  Marital Status  Annual Income Defaulted Borrower
0           1               1            125                 No
1           0               2            100                 No
2           0               1             70                 No
3           1               2            120                 No
4           0               3             95                Yes
5           0               2             60                 No
6           1               3            220                 No
7           0               1             85                Yes
8           0               2             75                 No
9           0               1             90                Yes
```

In [8]:
```
x=df.drop('Defaulted Borrower',axis=1)
y=df['Defaulted Borrower']
```

In [9]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.7,random_stat
x_train.shape,x_test.shape
```

Out[9]:
```
((7, 3), (3, 3))
```

In [10]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[10]:
```
RandomForestClassifier()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [11]:
```
rf=RandomForestClassifier()
```

In [12]:
```
params={'max_depth':[2,3,5,10,20],
       'min_samples_leaf':[5,10,20,50,100,200],
       'n_estimators':[10,25,30,50,100,200]}
```

In [13]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rf,param_grid=params,cv=2,scoring='accurac
grid_search.fit(x_train,y_train)
```

Out[13]:
```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [2, 3, 5, 10, 20],
                         'min_samples_leaf': [5, 10, 20, 50, 100, 200],
                         'n_estimators': [10, 25, 30, 50, 100, 200]},
             scoring='accuracy')
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [14]:
```
grid_search.best_score_
```

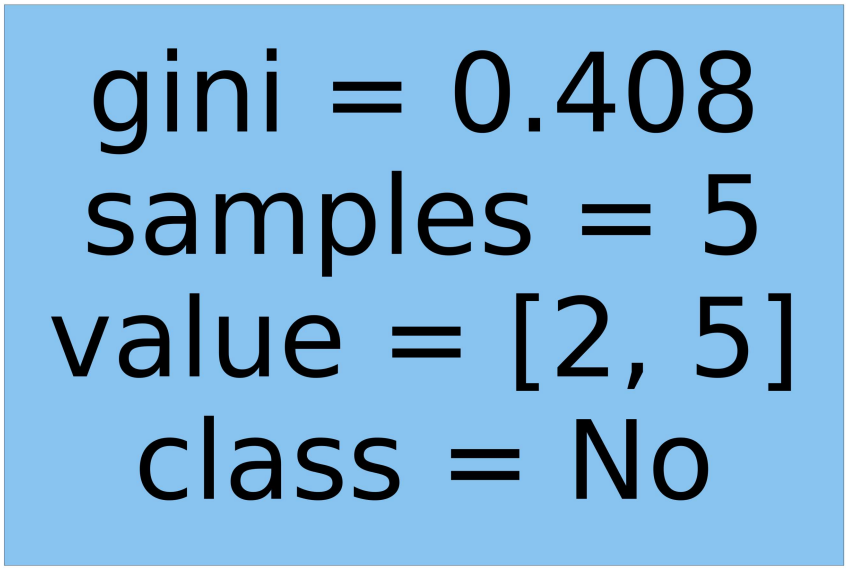
Out[14]:
```
0.5833333333333333
```

In [15]:
```
rf_best=grid_search.best_estimator_
print(rf_best)
```

```
RandomForestClassifier(max_depth=2, min_samples_leaf=5, n_estimators=10)
```

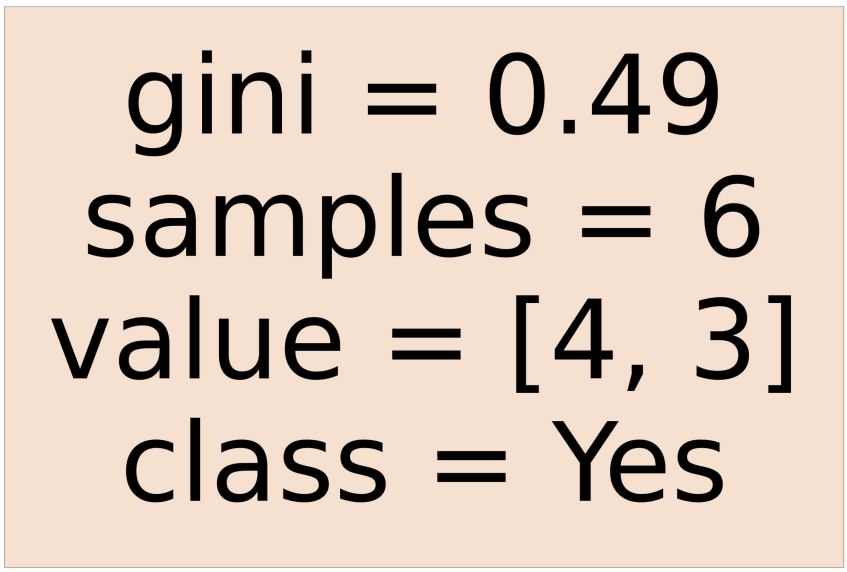
In [16]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[5],feature_names=x.columns,class_names=['Yes','
```

Out[16]:
```
[Text(0.5, 0.5, 'gini = 0.408\nsamples = 5\nvalue = [2, 5]\nclass = No')]
```



In [17]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[7],feature_names=x.columns,class_names=['Yes','
```

Out[17]:
```
[Text(0.5, 0.5, 'gini = 0.49\nsamples = 6\nvalue = [4, 3]\nclass = Yes')]
```



In [18]:
```
rf_best.feature_importances_
```

Out[18]:
```
array([0., 0., 0.])
```

In [19]:
```
imp_df=pd.DataFrame({'Varname':x_train.columns,"Imp":rf_best.feature_importar
imp_df.sort_values(by="Imp",ascending=False)
```

Out[19]:

	Varname	Imp
0	Home Owner	0.0
1	Marital Status	0.0
2	Annual Income	0.0

In [ ]:
```

```