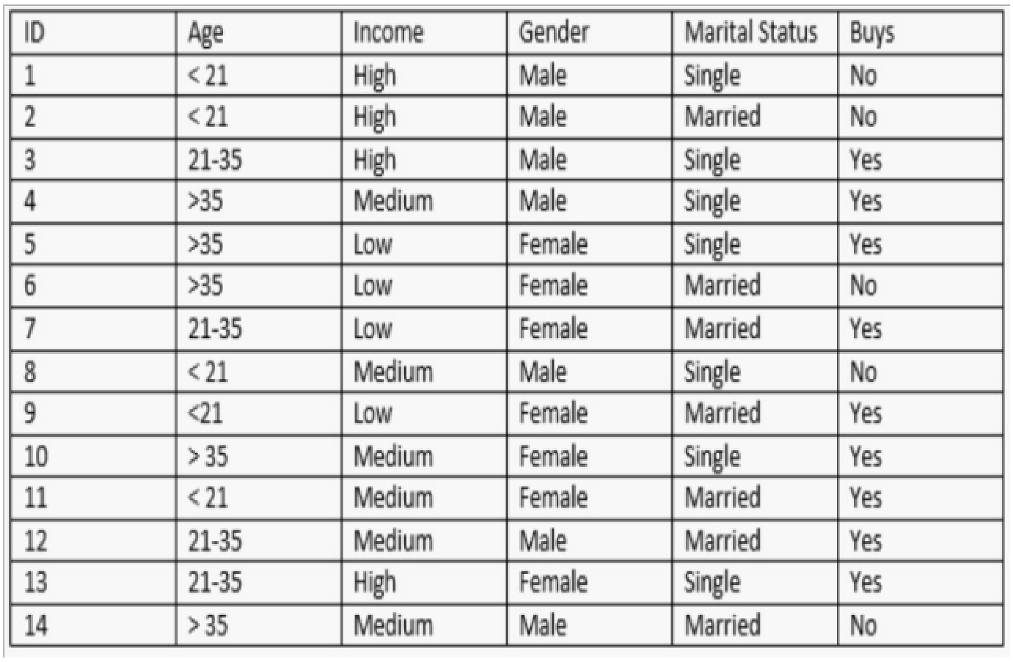
Assignment on Decision Tree Classifier:

A dataset collected in a cosmetics shop showing details of customers and whether or not they responded to a special offer to buy a new lip-stick is shown in table below. Use this dataset to build a decision tree, with Buys as the target variable, to help in buying lip-sticks in the future. Find the root node of decision tree. According to the decision tree you have made from previous training data set, what is the decision for the test data: [Age < 21,Income = Low, Gender = Female, Marital Status = Married]?



ID	Age	Income	Gender	Marital Status	Buys
1	< 21	High	Male	Single	No
2	< 21	High	Male	Married	No
3	21-35	High	Male	Single	Yes
4	>35	Medium	Male	Single	Yes
5	>35	Low	Female	Single	Yes
6	>35	Low	Female	Married	No
7	21-35	Low	Female	Married	Yes
8	< 21	Medium	Male	Single	No
9	<21	Low	Female	Married	Yes
10	> 35	Medium	Female	Single	Yes
11	< 21	Medium	Female	Married	Yes
12	21-35	Medium	Male	Married	Yes
13	21-35	High	Female	Single	Yes
14	> 35	Medium	Male	Married	No

In [17]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.tree import DecisionTreeClassifier
```

In [18]:

```
data = {
    'age': ['<21', '<21', '21-35', '>35', '>35', '>35', '21-35', '<21', '<21', '>35'
    'income':['high','high','high','medium','low','low','low','medium','low','medium
    'gender':['male','male','male','male','female','female','female','male','female'
    'marital_status':['single', 'married', 'single', 'single', 'single', 'married',
    'buys':['no','no','yes','yes','yes','no','yes','no','yes','yes','yes','yes','yes
}

df = pd.DataFrame.from_dict(data)
df
```

Out[18]:

```
     age  income  gender  marital_status  buys
0    <21    high    male          single    no
1    <21    high    male         married    no
2  21-35    high    male          single   yes
3    >35  medium    male          single   yes
4    >35     low  female          single   yes
5    >35     low  female         married    no
```

	age	income	gender	marital_status	buys
6	21-35	low	female	married	yes
7	<21	medium	male	single	no
8	<21	low	female	married	yes
9	>35	medium	female	single	yes
10	<21	medium	female	married	yes
11	21-35	medium	male	married	yes
12	21-35	high	female	single	yes
13	>35	medium	male	married	no

In [19]:

```
df.describe()
```

Out[19]:

	age	income	gender	marital_status	buys
count	14	14	14	14	14
unique	3	3	2	2	2
top	>35	medium	male	single	yes
freq	5	6	7	7	9

In [20]:

```
def encode_data(df, target):
    cat_cols = []
    for column in df.columns:
        if(df[column].dtype == 'object' and column != target):
            if len(df[column].unique()) > 2:
                cat_cols.append(column)
                features = df[column].value_counts().index.to_list()

                for key in features:
                    col_name = f"{column}_{key}"
                    df[col_name] = 0
                    df.loc[df[column] == key, col_name] = 1
    df.drop(columns=cat_cols, inplace=True)
    return df
```

	gender	marital_status	buys	age_>35	age_<21	age_21-35	income_medium	income_low	income_high
0	male	single	no	0	1	0	0	0	1
1	male	married	no	0	1	0	0	0	1
2	male	single	yes	0	0	1	0	0	1
3	male	single	yes	1	0	0	1	0	0
4	female	single	yes	1	0	0	0	1	0
5	female	married	no	1	0	0	0	1	0
6	female	married	yes	0	0	1	0	1	0
7	male	single	no	0	1	0	1	0	0
8	female	married	yes	0	1	0	0	1	0
9	female	single	yes	1	0	0	1	0	0
10	female	married	yes	0	1	0	1	0	0
11	male	married	yes	0	0	1	1	0	0
12	female	single	yes	0	0	1	0	0	1
13	male	married	no	1	0	0	1	0	0

In [21]:

```
def preprocess_data(df):
    df_encoded = encode_data(df, 'buys')
    for column in df_encoded:
        if df_encoded[column].dtype == "object" and len(df_encoded[column].unique())
            unique_values = df[column].unique()
            df_encoded[column] = df_encoded[column].map({
                f"{unique_values[0]}": 0,
                f"{unique_values[1]}": 1
            })
            print(f"For column {column}, class {unique_values[0]} maps to 0 and clas
    return df_encoded
```

	gender	marital_status	buys	age_>35	age_<21	age_21-35	income_medium	income_low	income_high
0	0	0	0	0	1	0	0	0	1
1	0	1	0	0	1	0	0	0	1
2	0	0	1	0	0	1	0	0	1
3	0	0	1	1	0	0	1	0	0
4	1	0	1	1	0	0	0	1	0
5	1	1	0	1	0	0	0	1	0
6	1	1	1	0	0	1	0	1	0
7	0	0	0	0	1	0	1	0	0
8	1	1	1	0	1	0	0	1	0
9	1	0	1	1	0	0	1	0	0
10	1	1	1	0	1	0	1	0	0
11	0	1	1	0	0	1	1	0	0
12	1	0	1	0	0	1	0	0	1
13	0	1	0	1	0	0	1	0	0

In [22]:

```
df_encoded = preprocess_data(df.copy())
```

```
For column gender, class male maps to 0 and class female maps to 1
For column marital_status, class single maps to 0 and class married maps to 1
For column buys, class no maps to 0 and class yes maps to 1
```

In [23]:

```
df_encoded
```

Out[23]:

	gender	marital_status	buys	age_>35	age_<21	age_21-35	income_medium	income_low	incom
0	0	0	0	0	1	0	0	0	
1	0	1	0	0	1	0	0	0	
2	0	0	1	0	0	1	0	0	
3	0	0	1	1	0	0	1	0	
4	1	0	1	1	0	0	0	1	
5	1	1	0	1	0	0	0	1	
6	1	1	1	0	0	1	0	1	
7	0	0	0	0	1	0	1	0	
8	1	1	1	0	1	0	0	1	
9	1	0	1	1	0	0	1	0	
10	1	1	1	0	1	0	1	0	
11	0	1	1	0	0	1	1	0	
12	1	0	1	0	0	1	0	0	
13	0	1	0	1	0	0	1	0	

In [26]:

```
X = df_encoded.drop(columns=['buys']).to_numpy()
y = df_encoded[['buys']].to_numpy()
y
```

Out[26]:

```
array([[0],
       [0],
       [1],
       [1],
       [1],
       [0],
       [1],
       [0],
       [1],
       [1],
       [1],
       [1],
       [1],
       [0]], dtype=int64)
```

In [27]:

```
classifier = DecisionTreeClassifier()
classifier.fit(X, y)
y_pred = classifier.predict(X)
y_pred = ['yes' if y==1 else 'no' for y in y_pred]
print(y_pred)
```

```
['no', 'no', 'yes', 'yes', 'yes', 'no', 'yes', 'no', 'yes', 'yes', 'yes', 'yes', 'ye
s', 'no']
```

In [ ]: