Classification on Titanic Dataset

1)Importing Libraries

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
import warnings
warnings.filterwarnings("ignore")
```

2)Importing Dataset

In [2]:

```
df = pd.read_csv('test_s.csv')
df.head()
```

Out[2]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarl
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	
1	2	1	1	Cumings, Mrs. John Bradley\r(Florence Briggs T...	female	38.0	1	0	PC 17599	71.2833	C85	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2.\r3101282	7.9250	NaN	
3	4	1	1	Futrelle, Mrs. Jacques Heath\r(Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	

3)Data Preprocessing

In [3]:

```
df.describe()
```

Out[3]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	876.000000	876.000000	876.000000	701.000000	876.000000	876.000000	876.000000
mean	445.929224	0.384703	2.304795	29.719215	0.528539	0.385845	32.391794
std	257.600137	0.486803	0.836059	14.583577	1.110102	0.809645	50.020501
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	222.750000	0.000000	2.000000	20.000000	0.000000	0.000000	7.917700
50%	446.500000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
75%	668.250000	1.000000	3.000000	38.000000	1.000000	0.000000	31.068750
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [4]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 876 entries, 0 to 875
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  876 non-null    int64  
 1   Survived     876 non-null    int64  
 2   Pclass       876 non-null    int64  
 3   Name         876 non-null    object 
 4   Sex          876 non-null    object 
 5   Age          701 non-null    float64
 6   SibSp        876 non-null    int64  
 7   Parch        876 non-null    int64  
 8   Ticket       876 non-null    object 
 9   Fare         876 non-null    float64
 10  Cabin        202 non-null    object 
 11  Embarked     874 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 82.2+ KB
```

In [5]:

```
df[df.isnull().any(axis=1)]
```

Out[5]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Eml
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2.\r3101282	7.9250	NaN	
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	
5	6	0	3	Moran, Mr. James	male	NaN	0	0	330877	8.4583	NaN	
7	8	0	3	Palsson, Master. Gosta Leonard	male	2.0	3	1	349909	21.0750	NaN	
...	...	...	...	...	...	...	...	...	...	...	...	
869	885	0	3	Sutehall, Mr. Henry Jr	male	25.0	0	0	SOTON/OQ\r392076	7.0500	NaN	
870	886	0	3	Rice, Mrs. William (Margaret\rNorton)	female	39.0	0	5	382652	29.1250	NaN	
871	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	
873	889	0	3	Johnston, Miss. Catherine Helen\r"Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	
875	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	

695 rows × 12 columns

In [6]:

```
df.isnull().values.any()
```

Out[6]:

True

True

In [7]:

```
df.isnull().sum()
```

Out[7]:

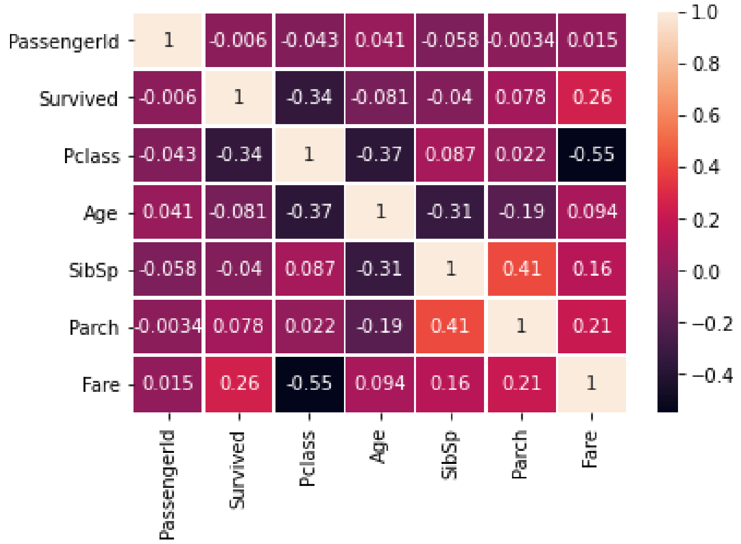
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            175
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          674
Embarked         2
dtype: int64
```

In [8]:

```
sns.heatmap(df.corr(), annot=True, linewidth = 0.5)
```

Out[8]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x132ca76e9c8>
```

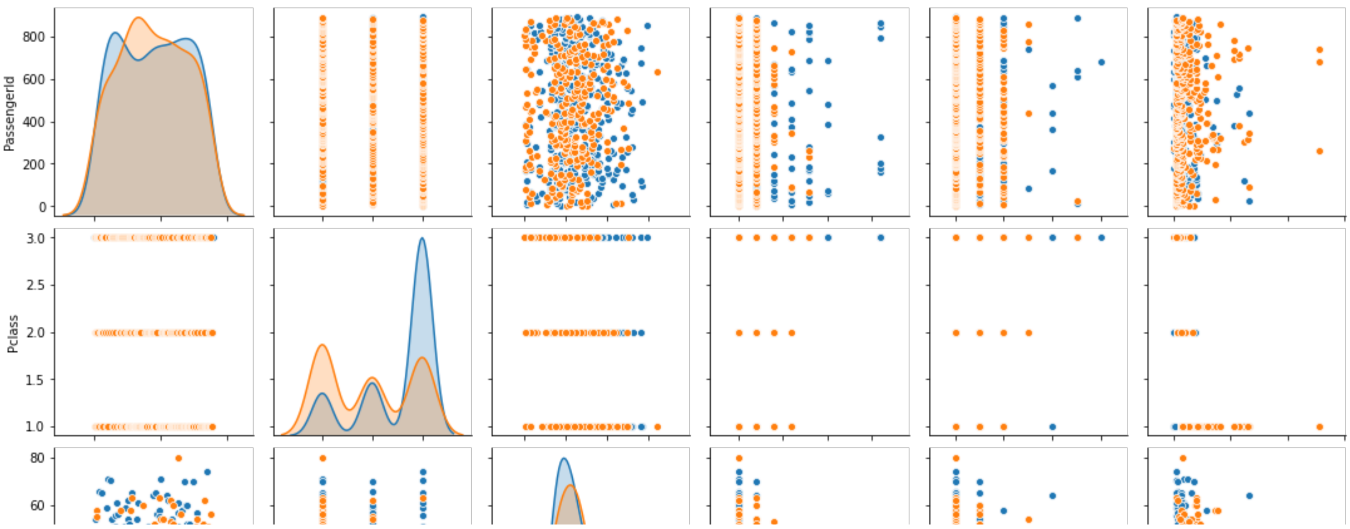


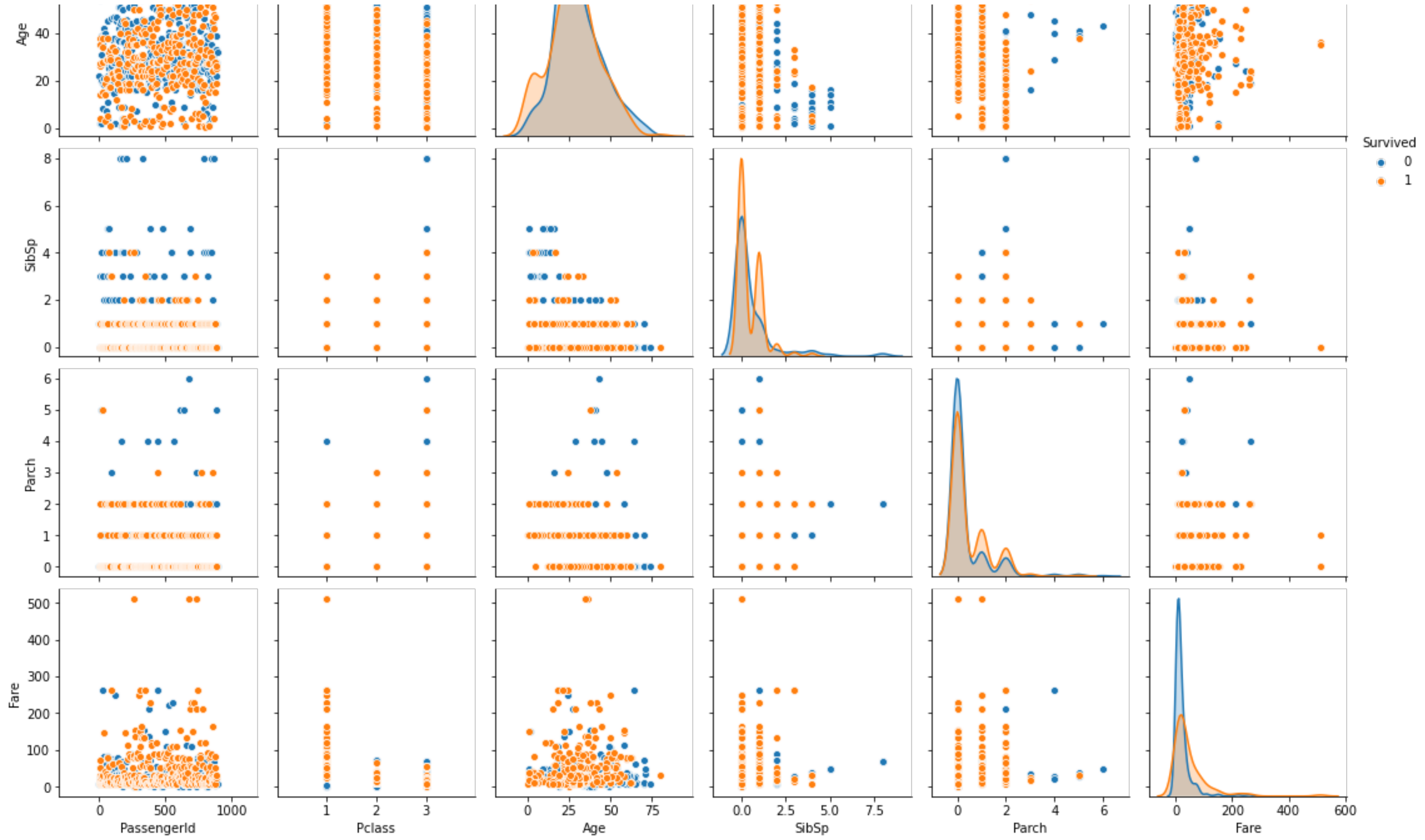
In [9]:

```
sns.pairplot(df,hue = 'Survived',dropna = True)
```

Out[9]:

```
<seaborn.axisgrid.PairGrid at 0x132caae98c8>
```





In [10]:

```
df.drop(['PassengerId', 'Name', 'Ticket', 'Cabin'],axis = 1,inplace = True)
```

In [11]:

```
df = df.dropna(subset =['Embarked', 'Age'])
```

In [12]:

```
df.isnull().sum()
```

Out[12]:

```
Survived    0
Pclass      0
Sex         0
Age         0
SibSp       0
Parch       0
Fare        0
Embarked    0
dtype: int64
```

In [13]:

```
df.isnull().values.any()
```

Out[13]:

```
False
```

In [14]:

```
IQR_Age = df['Age'].quantile(0.75) - df['Age'].quantile(0.25)
print(IQR_Age)
Upper_OutlierLimit_Age = df['Age'].quantile(0.75) + 1.5*IQR_Age
Lower_OutlierLimit_Age = df['Age'].quantile(0.25) - 1.5*IQR_Age
print(Upper_OutlierLimit_Age)
print(Lower_OutlierLimit_Age)
OutlierValues_Age = df[(df['Age']>=Upper_OutlierLimit_Age) | (df[
'Age']<=Lower_OutlierLimit_Age)]
OutlierValues_Age
```

```
18.0
65.0
-7.0
```

Out[14]:

	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
33	0	2	male	66.0	0	0	10.5000	S
53	0	1	male	65.0	0	1	61.9792	C
95	0	1	male	71.0	0	0	34.6542	C
114	0	3	male	70.5	0	0	7.7500	Q
276	0	3	male	65.0	0	0	7.7500	Q
448	0	1	male	65.0	0	0	26.5500	S
485	0	1	male	71.0	0	0	49.5042	C
619	1	1	male	80.0	0	0	30.0000	S
661	0	2	male	70.0	0	0	10.5000	S
732	0	1	male	70.0	1	1	71.0000	S
836	0	3	male	74.0	0	0	7.7750	S

In [15]:

```
df.loc[df.Age > 54.5,'Age'] =  df['Age'].quantile(0.95)
df.loc[df.Age < 2.5,'Age'] =  df['Age'].quantile(0.05)
```

In [16]:

```
IQR_Fare = df['Fare'].quantile(0.75) - df['Fare'].quantile(0.25)
print(IQR_Fare)
Upper_OutlierLimit_Fare = df['Fare'].quantile(0.75) + 1.5*IQR_Fare
Lower_OutlierLimit_Fare = df['Fare'].quantile(0.25) - 1.5*IQR_Fare
print(Upper_OutlierLimit_Fare)
print(Lower_OutlierLimit_Fare)
OutlierValues_Fare = df[(df['Fare']>=Upper_OutlierLimit_Fare) | (df[
'Fare']<=Lower_OutlierLimit_Fare)]
OutlierValues_Fare
```

```
24.95
70.425
-29.374999999999996
```

Out[16]:

	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
1	1	1	female	38.0	1	0	71.2833	C
27	0	1	male	19.0	3	2	263.0000	S
34	0	1	male	28.0	1	0	82.1708	C
61	0	1	male	45.0	1	0	83.4750	S
71	0	2	male	21.0	0	0	73.5000	S
...	...	...	...	...	...	...	...	...
788	1	1	male	11.0	1	2	120.0000	S
806	1	1	female	52.0	1	1	93.5000	S
821	1	1	female	39.0	1	1	83.1583	C
841	1	1	female	45.0	1	1	164.8667	S
864	1	1	female	56.0	0	1	83.1583	C

94 rows × 8 columns

In [17]:

```
df.loc[df.Fare > 65.795325,'Fare'] =  df['Fare'].quantile(0.95)
df.loc[df.Fare < -26.808875000000004,'Fare'] =  df['Fare'].quantile(0.05)
```

In [18]:

```
obj = df.dtypes == np.object
df.columns[obj]
```

Out[18]:

```
Index(['Sex', 'Embarked'], dtype='object')
```

In [19]:

```
dummydf = pd.DataFrame()
for i in df.columns[obj]:
    dummy = pd.get_dummies(df[i], drop_first=True)
    dummydf = pd.concat([dummydf, dummy], axis=1)


print(dummydf)
```

```
     male  Q  S
0       1  0  1
1       0  0  0
2       0  0  1
3       0  0  1
4       1  0  1
..    ... .. ..
870     0  1  0
871     1  0  1
872     0  0  1
874     1  0  0
875     1  1  0

[699 rows x 3 columns]
```

In [20]:

```
df = pd.concat([df,dummydf], axis=1)
```

In [21]:

```
dataset = df[['Pclass','Age','SibSp','Parch','Fare','male','Q','S','Survived']]
```

In [22]:

```
dataset.head(10)
```

Out[22]:

	Pclass	Age	SibSp	Parch	Fare	male	Q	S	Survived
0	3	22.0	1	0	7.2500	1	0	1	0
1	1	38.0	1	0	120.0000	0	0	0	1
2	3	26.0	0	0	7.9250	0	0	1	1
3	1	35.0	1	0	53.1000	0	0	1	1
4	3	35.0	0	0	8.0500	1	0	1	0
6	1	54.0	0	0	51.8625	1	0	1	0
7	3	4.0	3	1	21.0750	1	0	1	0
8	3	27.0	0	2	11.1333	0	0	1	1
9	2	14.0	1	0	30.0708	0	0	0	1
10	3	4.0	1	1	16.7000	0	0	1	1

In [23]:

```
dataset.shape
```

Out[23]:

```
(699, 9)
```

4)Creating X and Y variables

In [24]:

```
X = dataset.iloc[:,:-1].values
X
```

Out[24]:

```
array([[ 3., 22.,  1., ...,  1.,  0.,  1.],
       [ 1., 38.,  1., ...,  0.,  0.,  0.],
       [ 3., 26.,  0., ...,  0.,  0.,  1.],
       ...,
       [ 1., 19.,  0., ...,  0.,  0.,  1.],
       [ 1., 26.,  0., ...,  1.,  0.,  0.],
       [ 3., 32.,  0., ...,  1.,  1.,  0.]])
```

In [25]:

```
y = dataset.iloc[:,-1].values
y
```

Out[25]:

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

5)Splitting into Train & Test Data

In [26]:

```
from sklearn.model_selection import train_test_split
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, random_state
= 0)
```

In [27]:

```
X_train
```

Out[27]:

```
array([[ 3.,  3.,  3., ...,  0.,  0.,  1.],
       [ 2., 17.,  0., ...,  0.,  0.,  1.],
       [ 2., 56.,  0., ...,  1.,  1.,  0.],
       ...,
       [ 3., 31.,  0., ...,  1.,  0.,  1.],
       [ 2., 27.,  0., ...,  0.,  0.,  1.],
       [ 2., 28.,  1., ...,  0.,  0.,  0.]])
```

In [28]:

```
y_train
```

Out[28]:

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

In [29]:

```
X_test
```

Out[29]:

```
array([[ 3., 26.,  1., ...,  0.,  0.,  1.],
       [ 2., 25.,  1., ...,  1.,  0.,  0.],
       [ 2., 21.,  0., ...,  0.,  0.,  1.],
       ...,
       [ 3., 18.,  0., ...,  1.,  0.,  1.],
       [ 1., 27.,  0., ...,  1.,  0.,  1.],
       [ 1., 45.,  1., ...,  1.,  0.,  1.]])
```

In [30]:

```
y_test
```

Out[30]:

```
array([0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1,
       0, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1,
       0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0,
```

```
       0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0,
       0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 0,
       1, 1, 1, 1, 1, 0, 1, 0], dtype=int64)
```

In [31]:

```
from sklearn.preprocessing import StandardScaler
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

In [32]:

```
X_train
```

Out[32]:

```
array([[ 0.89943714, -1.92529953,  2.7498332 , ..., -1.35556758,
        -0.21180135,  0.52837127],
       [-0.29482738, -0.90840042, -0.55825165, ..., -1.35556758,
        -0.21180135,  0.52837127],
       [-0.29482738,  1.92438996, -0.55825165, ...,  0.73769838,
         4.72140516, -1.89260857],
       ...,
       [ 0.89943714,  0.10849869, -0.55825165, ...,  0.73769838,
        -0.21180135,  0.52837127],
       [-0.29482738, -0.18204391, -0.55825165, ..., -1.35556758,
        -0.21180135,  0.52837127],
       [-0.29482738, -0.10940826,  0.5444433 , ..., -1.35556758,
        -0.21180135, -1.89260857]])
```

In [33]:

```
X_test
```

Out[33]:

```
array([[ 0.89943714, -0.25467956,  0.5444433 , ..., -1.35556758,
        -0.21180135,  0.52837127],
       [-0.29482738, -0.32731521,  0.5444433 , ...,  0.73769838,
        -0.21180135, -1.89260857],
       [-0.29482738, -0.61785782, -0.55825165, ..., -1.35556758,
        -0.21180135,  0.52837127],
       ...,
       [ 0.89943714, -0.83576477, -0.55825165, ...,  0.73769838,
        -0.21180135,  0.52837127],
       [-1.4890919 , -0.18204391, -0.55825165, ...,  0.73769838,
        -0.21180135,  0.52837127],
       [-1.4890919 ,  1.1253978 ,  0.5444433 , ...,  0.73769838,
        -0.21180135,  0.52837127]])
```

6)Building the Model and Testing Accuracy

a)Logistic Regression

In [34]:

```
from sklearn.linear_model import LogisticRegression

lr = LogisticRegression()
lr.fit(X_train, y_train)
```

Out[34]:

```
LogisticRegression()
```

In [35]:

```
y_pred = lr.predict(X_test)
```

```
y_pred
```

Out[35]:

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

In [36]:

```
y_test
```

Out[36]:

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

In [37]:

```
from sklearn.metrics import confusion_matrix
confusion = confusion_matrix(y_test, y_pred)
print(confusion)
```

```
[[69  7]
 [15 49]]
```

In [38]:

```
from sklearn import metrics
metrics.accuracy_score(y_test, y_pred)
```

Out[38]:

```
0.8428571428571429
```

Accuracy of Logistic Regression Model: 0.8428571428571429

b)K Nearest Neighbours Classification

In [39]:

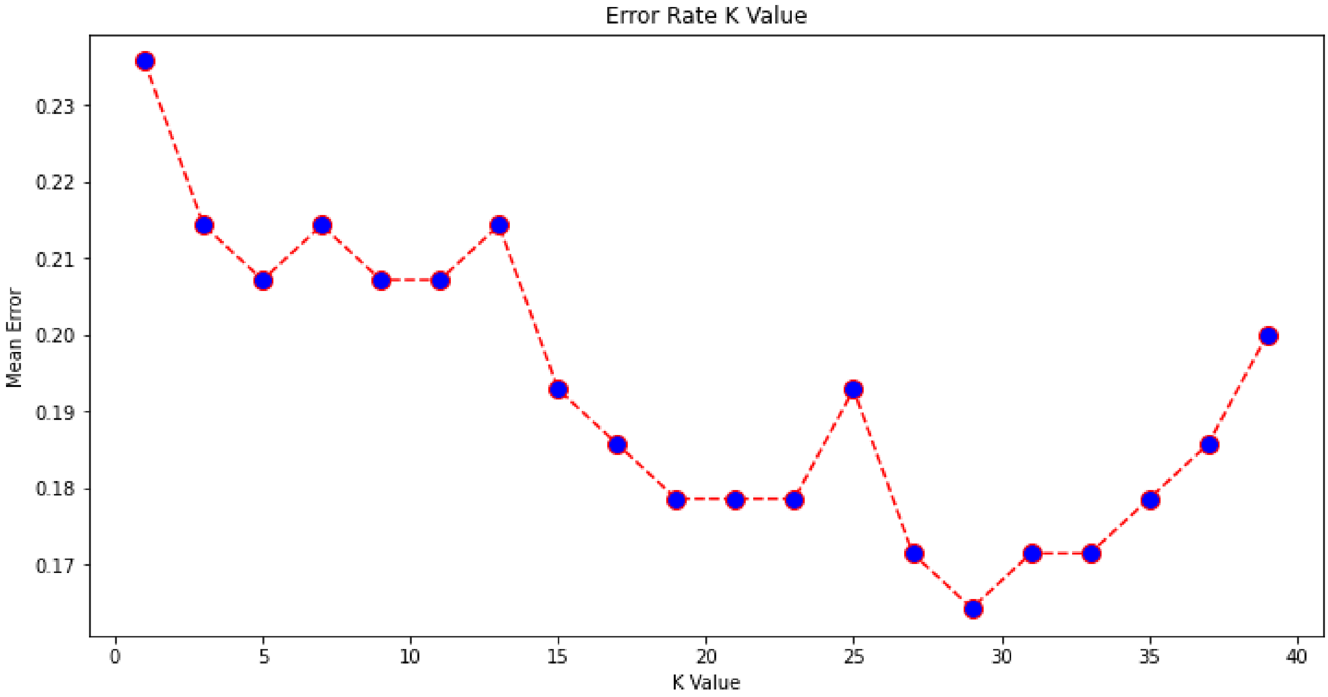
```
from sklearn.neighbors import KNeighborsClassifier
error = []
accuracy = []

# Calculating error for K values between 1 and 40
for i in range(1,40,2):
    knn = KNeighborsClassifier(n_neighbors=i)
    knn.fit(X_train, y_train)
    pred_i = knn.predict(X_test)
    error.append(np.mean(pred_i != y_test))
    accuracy.append(metrics.accuracy_score(y_test, pred_i))
```

In [40]:

```
plt.figure(figsize=(12, 6))
plt.plot(range(1,40,2), error, color='red', linestyle='dashed', marker='o',
         markerfacecolor='blue', markersize=10)
plt.title('Error Rate K Value')
plt.xlabel('K Value')
plt.ylabel('Mean Error')
```

Out[40]:

```
Text(0, 0.5, 'Mean Error')
```

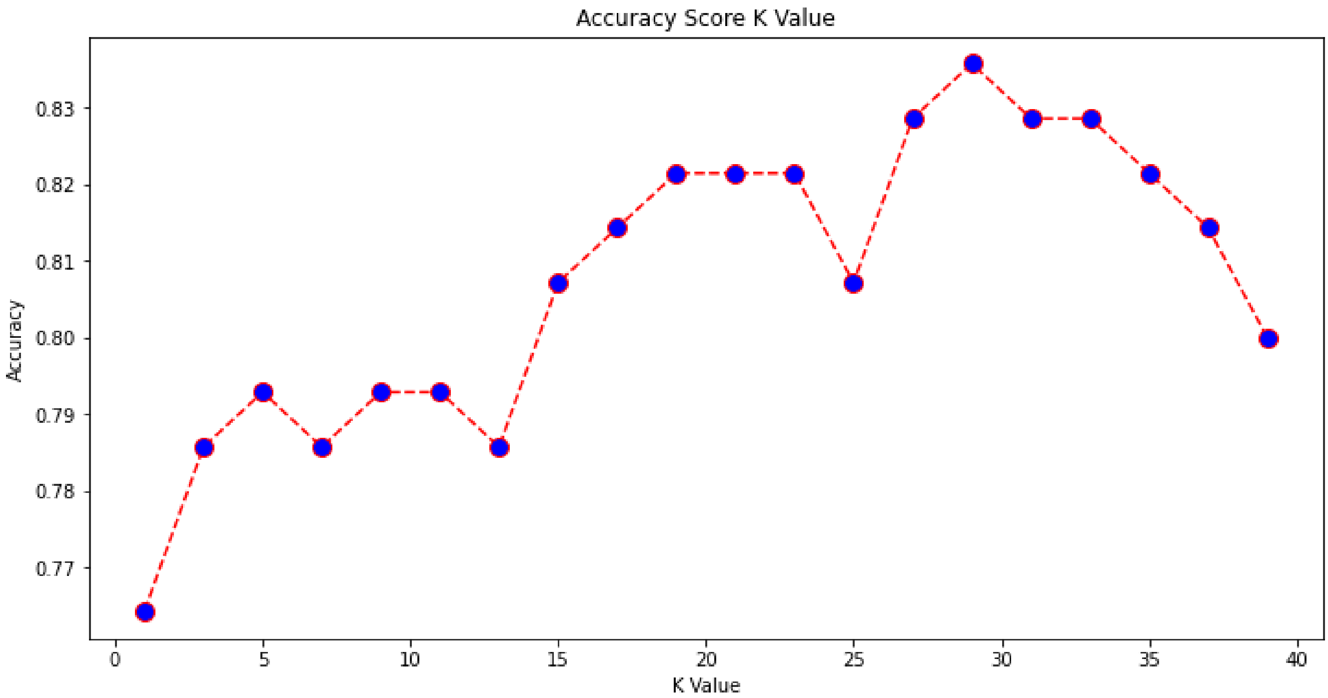


In [41]:

```
plt.figure(figsize=(12, 6))
plt.plot(range(1,40,2), accuracy, color='red', linestyle='dashed', marker='o',
         markerfacecolor='blue', markersize=10)
plt.title('Accuracy Score K Value')
plt.xlabel('K Value')
plt.ylabel('Accuracy')
```

Out[41]:

```
Text(0, 0.5, 'Accuracy')
```



In [42]:

```
knn = KNeighborsClassifier(n_neighbors = 30, metric = 'minkowski', p = 2)
knn.fit(X_train, y_train)
```

Out[42]:

```
KNeighborsClassifier(n_neighbors=30)
```

In [43]:

```
y_pred = knn.predict(X_test)
y_pred
```

Out[43]:

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

In [44]:

```
confusion_matrix(y_test, y_pred)
```

Out[44]:

```
array([[69,  7],
       [18, 46]], dtype=int64)
```

In [45]:

```
print(metrics.classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.79      0.91      0.85        76
           1       0.87      0.72      0.79        64

    accuracy                           0.82       140
   macro avg       0.83      0.81      0.82       140
weighted avg       0.83      0.82      0.82       140
```

In [46]:

```
metrics.accuracy_score(y_test, y_pred)
```

Out[46]:

```
0.8214285714285714
```

Accuracy of KNN Classification Model: 0.8214285714285714

c)Decision Tree Classifier

In [47]:

```
from sklearn.tree import DecisionTreeClassifier
clf = DecisionTreeClassifier(criterion = 'entropy', random_state = 0)
clf.fit(X_train, y_train)

y_pred = clf.predict(X_test)
y_pred
```

Out[47]:

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

In [48]:

In [48]:

```
confusion_matrix(y_test, y_pred)
```

Out[48]:

```
array([[65, 11],
       [18, 46]], dtype=int64)
```

In [49]:

```
import graphviz
from sklearn import tree
from PIL import Image
dot_data = tree.export_graphviz(clf,
                                out_file=None,
                                filled=True,
                                rounded=True,
                                max_depth = 6,
                                special_characters=True,
                               feature_names = ['Pclass','Age','SibSp','Parch','Fare','m
ale','Q','S'])
graph = graphviz.Source(dot_data,format = "png")
graph.render('sample', view=True)
graph
```

Out[49]:

In [50]:

```
print(metrics.classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.78      0.86      0.82        76
           1       0.81      0.72      0.76        64

    accuracy                           0.79       140
   macro avg       0.80      0.79      0.79       140
weighted avg       0.79      0.79      0.79       140
```

In [51]:

```
metrics.accuracy_score(y_test, y_pred)
```

Out[51]:

```
0.7928571428571428
```

Accuracy of Decision Tree Classification Model: 0.7928571428571428

d)Random Forest Classifier

In [52]:

```
from sklearn.ensemble import RandomForestClassifier

clf =RandomForestClassifier(n_estimators = 20, criterion = 'entropy', random_state = 0)
clf.fit(X_train, y_train)
y_pred = clf.predict(X_test)
y_pred
```

Out[52]:

```
array([1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1,
       0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1,
       0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0,
       0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0,
```

```
       1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0,
       0, 1, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0,
       1, 1, 1, 1, 0, 0, 1, 0], dtype=int64)
```

In [53]:

```
confusion_matrix(y_test, y_pred)
```

Out[53]:

```
array([[62, 14],
       [19, 45]], dtype=int64)
```

In [54]:

```
print(metrics.classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.77      0.82      0.79        76
           1       0.76      0.70      0.73        64

    accuracy                           0.76       140
   macro avg       0.76      0.76      0.76       140
weighted avg       0.76      0.76      0.76       140
```

In [55]:

```
metrics.accuracy_score(y_test, y_pred)
```

Out[55]:

```
0.7642857142857142
```

Accuracy of Random Forest Classification Model: 0.7642857142857142

CONCLUSION:

From the above observations,it is obvious that Logistic Regression performs well on the titanic dataset model and gives the highest accuracy of 84%.So,LOGISTIC REGRESSION IS THE BEST MODEL