# Data Preprocessing

# 1.Import the Libraries

In [1]:

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

# 2.import dataset

In [41]:

```
df=pd.read_csv("Titanic-Dataset.csv")
```

In [79]:

```
df.head()
```

Out[79]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 65.6344 | C |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S |

In [4]:

```
df.describe()
```

Out[4]:

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare |
|---|---|---|---|---|---|---|---|
| **count** | 891.000000 | 891.000000 | 891.000000 | 714.000000 | 891.000000 | 891.000000 | 891.000000 |
| **mean** | 446.000000 | 0.383838 | 2.308642 | 29.699118 | 0.523008 | 0.381594 | 32.204208 |
| **std** | 257.353842 | 0.486592 | 0.836071 | 14.526497 | 1.102743 | 0.806057 | 49.693429 |
| **min** | 1.000000 | 0.000000 | 1.000000 | 0.420000 | 0.000000 | 0.000000 | 0.000000 |
| **25%** | 223.500000 | 0.000000 | 2.000000 | 20.125000 | 0.000000 | 0.000000 | 7.910400 |
| **50%** | 446.000000 | 0.000000 | 3.000000 | 28.000000 | 0.000000 | 0.000000 | 14.454200 |
| **75%** | 668.500000 | 1.000000 | 3.000000 | 38.000000 | 1.000000 | 0.000000 | 31.000000 |
| **max** | 891.000000 | 1.000000 | 3.000000 | 80.000000 | 8.000000 | 6.000000 | 512.329200 |

In [5]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

In [6]:
```
df.corr()
```

```
C:\Users\saisa\AppData\Local\Temp\ipykernel_17732\1134722465.py:1: FutureWarning: 
The default value of numeric_only in DataFrame.corr is deprecated. In a future ver
sion, it will default to False. Select only valid columns or specify the value of 
numeric_only to silence this warning.
  df.corr()
```

Out[6]:

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare |
|---|---|---|---|---|---|---|---|
| **PassengerId** | 1.000000 | -0.005007 | -0.035144 | 0.036847 | -0.057527 | -0.001652 | 0.012658 |
| **Survived** | -0.005007 | 1.000000 | -0.338481 | -0.077221 | -0.035322 | 0.081629 | 0.257307 |
| **Pclass** | -0.035144 | -0.338481 | 1.000000 | -0.369226 | 0.083081 | 0.018443 | -0.549500 |
| **Age** | 0.036847 | -0.077221 | -0.369226 | 1.000000 | -0.308247 | -0.189119 | 0.096067 |
| **SibSp** | -0.057527 | -0.035322 | 0.083081 | -0.308247 | 1.000000 | 0.414838 | 0.159651 |
| **Parch** | -0.001652 | 0.081629 | 0.018443 | -0.189119 | 0.414838 | 1.000000 | 0.216225 |
| **Fare** | 0.012658 | 0.257307 | -0.549500 | 0.096067 | 0.159651 | 0.216225 | 1.000000 |

In [7]:
```
df.corr().Fare.sort_values(ascending=False)
```

```
C:\Users\saisa\AppData\Local\Temp\ipykernel_17732\60082530.py:1: FutureWarning: Th
e default value of numeric_only in DataFrame.corr is deprecated. In a future versi
on, it will default to False. Select only valid columns or specify the value of nu
meric_only to silence this warning.
  df.corr().Fare.sort_values(ascending=False)
```

Out[7]:
```
Fare           1.000000
Survived       0.257307
Parch          0.216225
SibSp          0.159651
Age            0.096067
PassengerId    0.012658
Pclass        -0.549500
Name: Fare, dtype: float64
```

# 3.checking for null values

In [8]:
```
df.isnull().any()
```

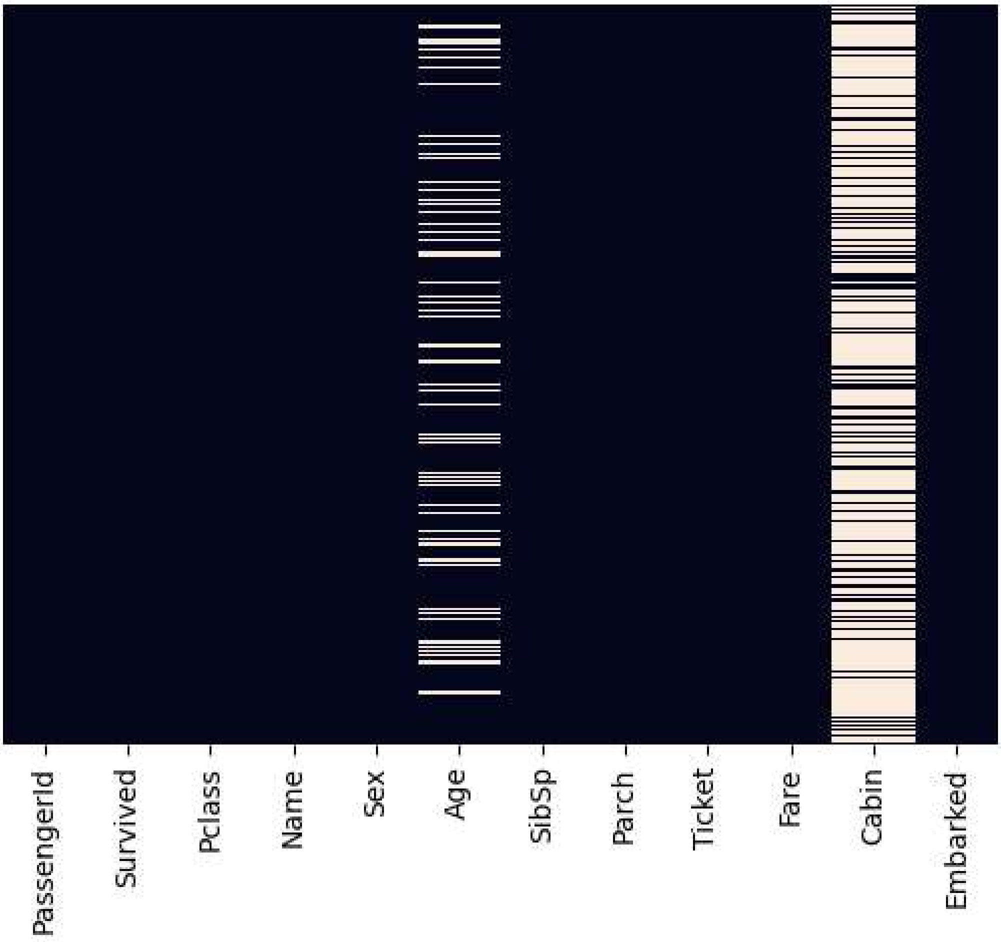
Out[8]:
```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age             True
SibSp          False
Parch          False
Ticket         False
Fare           False
Cabin           True
Embarked        True
dtype: bool
```

In [9]:
```
df.isnull().sum()
```

Out[9]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [10]:
```
sns.heatmap(df.isnull(),yticklabels=False,cbar=False)
```

Out[10]:
```
<Axes: >
```



In [43]:

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

Out[43]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S |

In [44]:

```
df['Age']=df['Age'].fillna(df['Age'].mode()[0])
```

In [45]:

```
df['Embarked']=df['Embarked'].fillna(df['Embarked'].mode()[0])
```

In [46]:

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

Out[46]:

```
Survived    False
Pclass      False
Sex         False
Age         False
SibSp       False
Parch       False
Fare        False
Embarked    False
dtype: bool
```

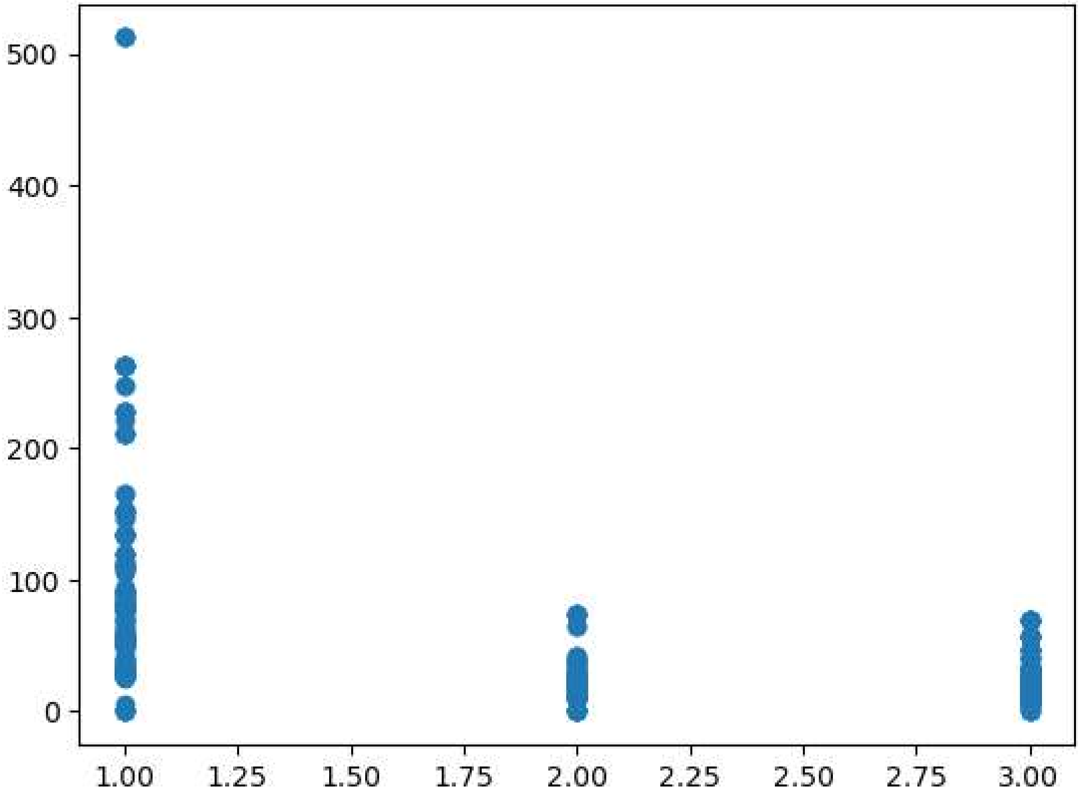
# 4.data visualization

In [47]:

```
plt.scatter(df["Pclass"],df["Fare"])
```

Out[47]:

```
<matplotlib.collections.PathCollection at 0x1f37d22cf10>
```

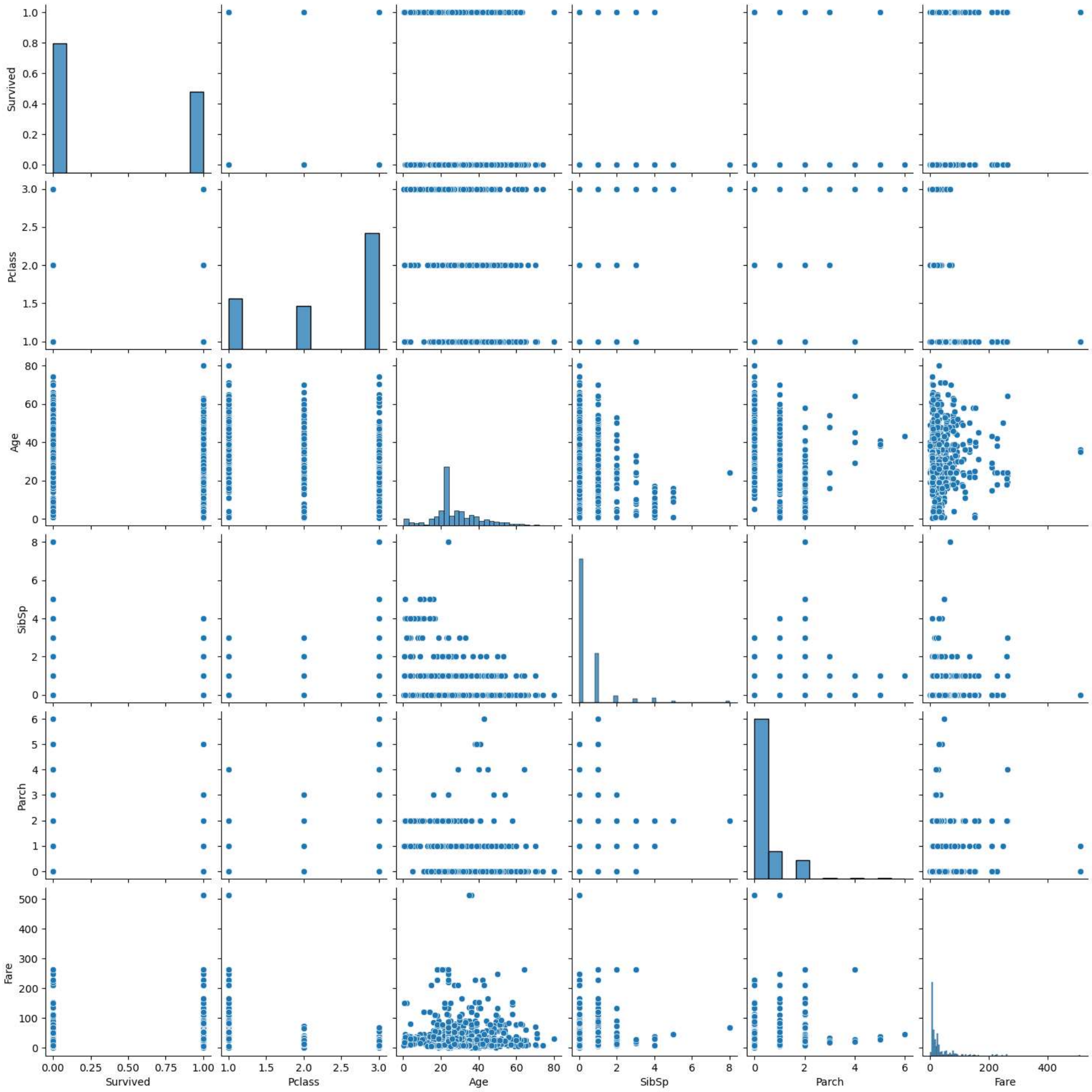


In [48]:

```
sns.pairplot(df)
```

Out[48]:

```
<seaborn.axisgrid.PairGrid at 0x1f304ef9310>
```



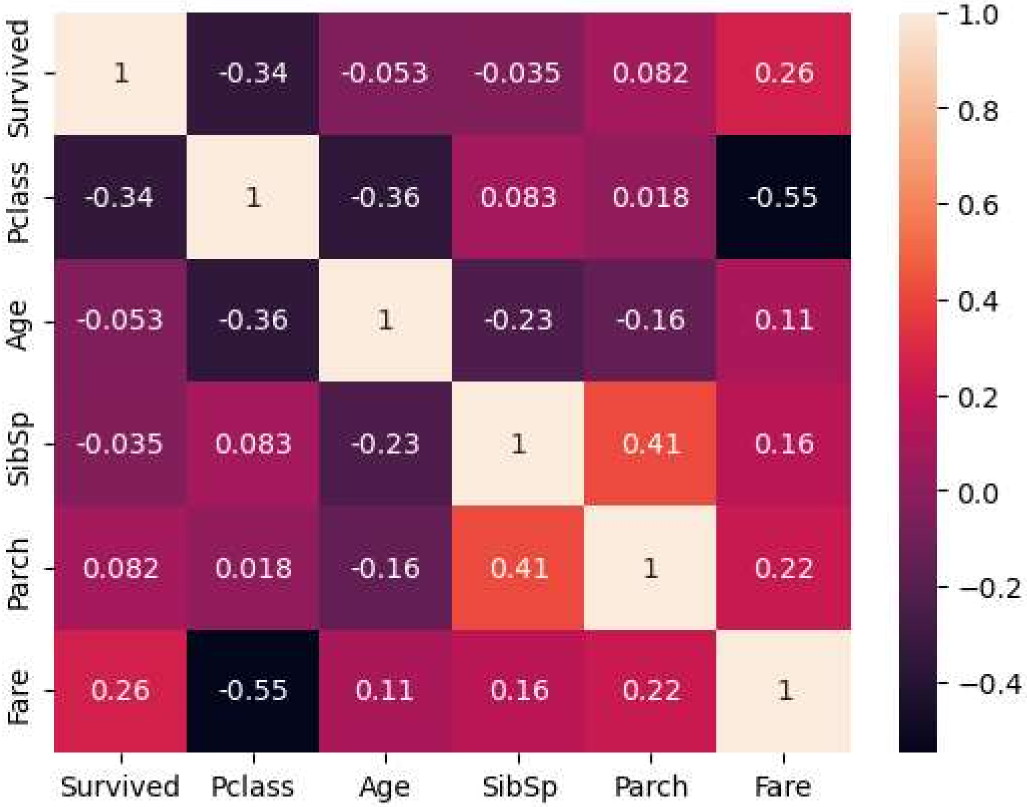
In [49]:

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

```
C:\Users\saisa\AppData\Local\Temp\ipykernel_17732\2221401063.py:1: FutureWarning:
The default value of numeric_only in DataFrame.corr is deprecated. In a future ver
sion, it will default to False. Select only valid columns or specify the value of
numeric_only to silence this warning.
  sns.heatmap(df.corr(),annot = True)
```

Out[49]:

```
<Axes: >
```



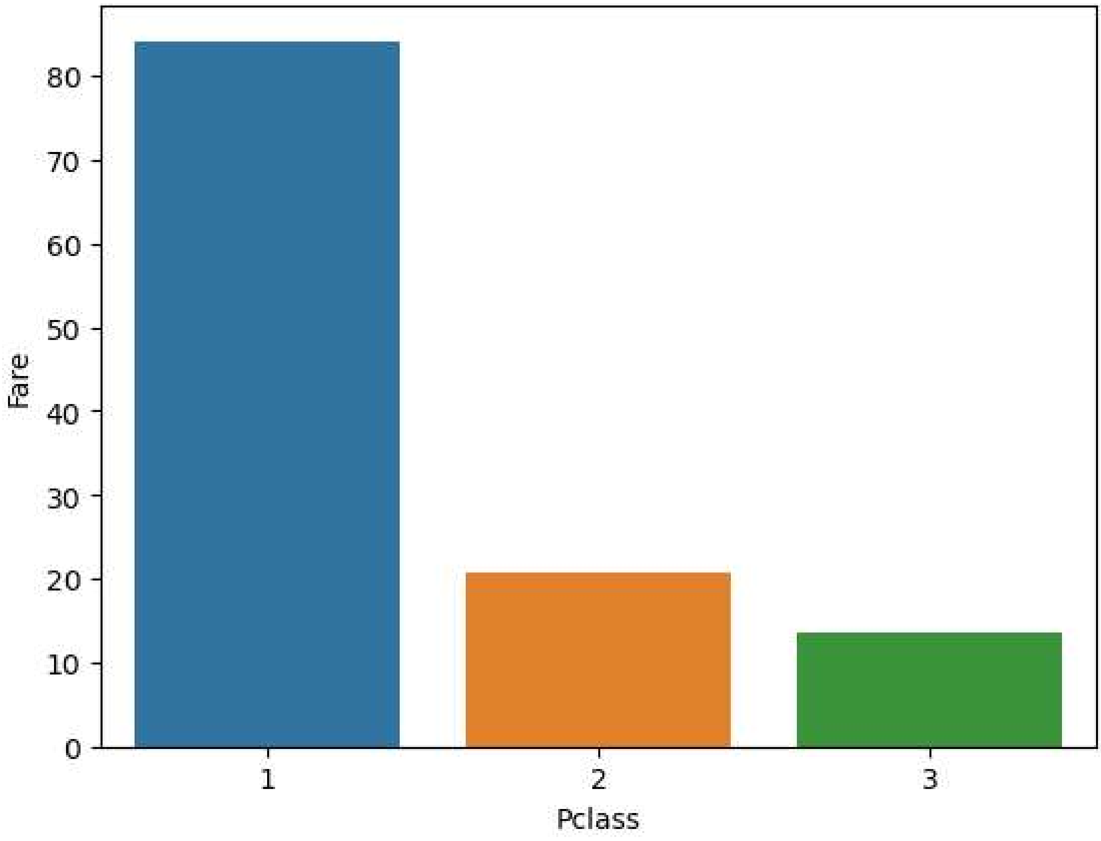
In [50]:
```
sns.barplot(x=df["Pclass"],y=df["Fare"],ci=0)
```

```
C:\Users\saisa\AppData\Local\Temp\ipykernel_17732\1541779687.py:1: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=('ci', 0)` for the same effect.

  sns.barplot(x=df["Pclass"],y=df["Fare"],ci=0)
```

Out[50]:
```
<Axes: xlabel='Pclass', ylabel='Fare'>
```



# 5.outlier detection

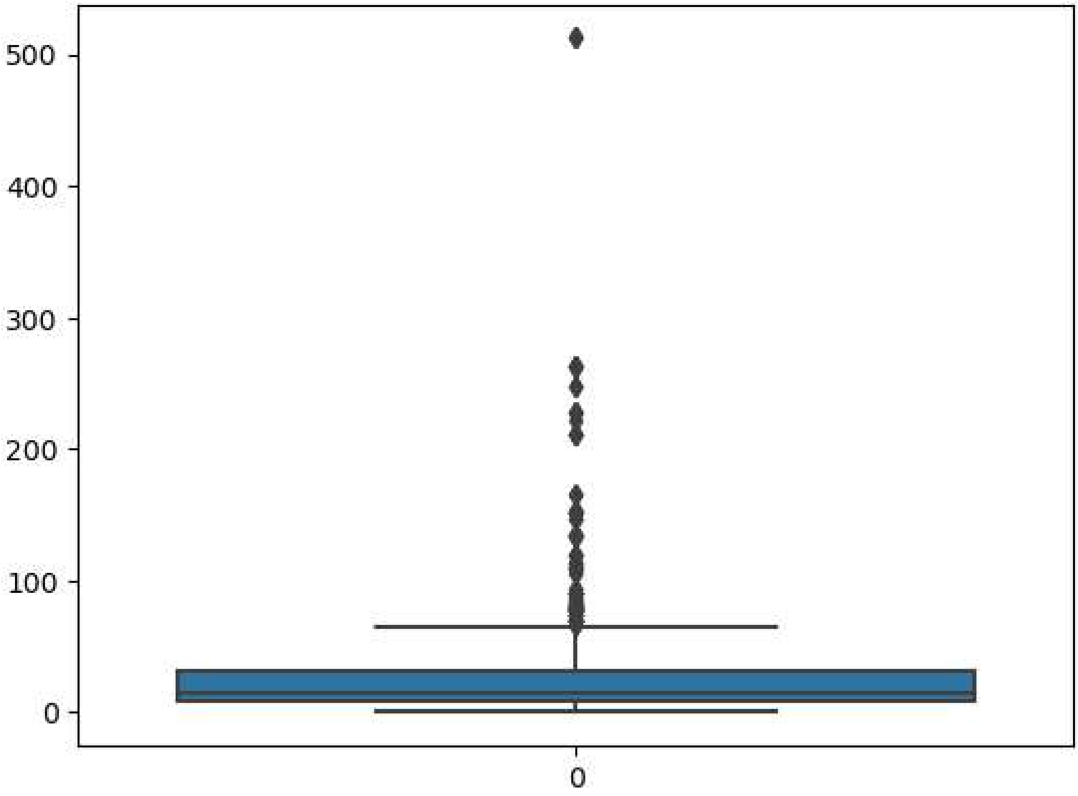
In [51]:
```
df.head()
```

Out[51]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S |

In [55]:
```
sns.boxplot(df["Fare"])
```

Out[55]:
```
<Axes: >
```



In [57]:
```
Q1 = df['Fare'].quantile(0.25)
Q3 = df['Fare'].quantile(0.75)
IQR = Q3 - Q1
whisker_width = 1.5
Fare_outliers = df[(df['Fare'] < Q1 - whisker_width*IQR) | (df['Fare'] > Q3 + whisl
Fare_outliers.head()
```

Out[57]:

| | 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 |
| **31** | 1 | 1 | female | 24.0 | 1 | 0 | 146.5208 | C |
| **34** | 0 | 1 | male | 28.0 | 1 | 0 | 82.1708 | C |
| **52** | 1 | 1 | female | 49.0 | 1 | 0 | 76.7292 | C |

In [58]:

```
fare_mean = df['Fare'].mean()
fare_std = df['Fare'].std()
low= fare_mean -(3 * fare_std)
high= fare_mean + (3 * fare_std)
fare_outliers = df[(df['Fare'] < low) | (df['Fare'] > high)]
fare_outliers.head()
```

Out[58]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked |
|---|---|---|---|---|---|---|---|---|
| **27** | 0 | 1 | male | 19.0 | 3 | 2 | 263.0000 | S |
| **88** | 1 | 1 | female | 23.0 | 3 | 2 | 263.0000 | S |
| **118** | 0 | 1 | male | 24.0 | 0 | 1 | 247.5208 | C |
| **258** | 1 | 1 | female | 35.0 | 0 | 0 | 512.3292 | C |
| **299** | 1 | 1 | female | 50.0 | 0 | 1 | 247.5208 | C |

In [61]:

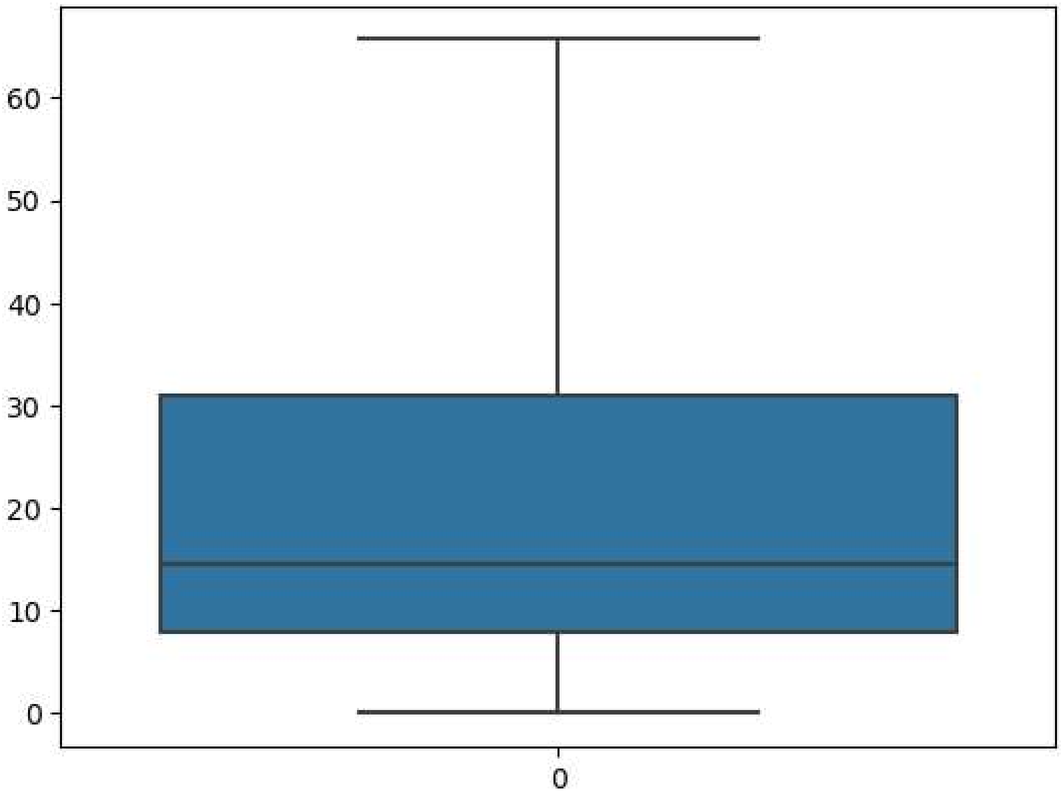
```
Q1 = df['Fare'].quantile(0.25)
Q3 = df['Fare'].quantile(0.75)
IQR = Q3 - Q1
whisker_width = 1.5
lower_whisker = Q1 -(whisker_width*IQR)
upper_whisker = Q3 +(whisker_width*IQR)
df['Fare']=np.where(df['Fare']>upper_whisker,upper_whisker,np.where(df['Fare']<lowe
```

In [63]:

```
sns.boxplot(df['Fare'])
```

Out[63]:

```
<Axes: >
```



# 6.Splitting Dependent and independent variables

In [64]:

```
X=df.drop(columns=["Fare"],axis=1)
X.head()
```

Out[64]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Embarked |
|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | S |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | C |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | S |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | S |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | S |

In [65]:

```
y=df["Fare"]
y.head()
```

Out[65]:

```
0     7.2500
1    65.6344
2     7.9250
3    53.1000
4     8.0500
Name: Fare, dtype: float64
```

# 7.Encoding

In [66]:

```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

In [67]:

```
X["Sex"]=le.fit_transform(X["Sex"])
X.head()
```

Out[67]:

|  | Survived | Pclass | Sex | Age | SibSp | Parch | Embarked |
|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | 1 | 22.0 | 1 | 0 | S |
| **1** | 1 | 1 | 0 | 38.0 | 1 | 0 | C |
| **2** | 1 | 3 | 0 | 26.0 | 0 | 0 | S |
| **3** | 1 | 1 | 0 | 35.0 | 1 | 0 | S |
| **4** | 0 | 3 | 1 | 35.0 | 0 | 0 | S |

In [68]:

```
mapping=dict(zip(le.classes_,range(len(le.classes_))))
mapping
```

Out[68]:

```
{'female': 0, 'male': 1}
```

In [71]:

```
X["Embarked"]=le.fit_transform(X["Embarked"])
X.head()
```

Out[71]:

|  | Survived | Pclass | Sex | Age | SibSp | Parch | Embarked |
|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | 1 | 22.0 | 1 | 0 | 2 |
| **1** | 1 | 1 | 0 | 38.0 | 1 | 0 | 0 |
| **2** | 1 | 3 | 0 | 26.0 | 0 | 0 | 2 |
| **3** | 1 | 1 | 0 | 35.0 | 1 | 0 | 2 |
| **4** | 0 | 3 | 1 | 35.0 | 0 | 0 | 2 |

In [72]:

```
print(le.classes_)
```

```
['C' 'Q' 'S']
```

In [73]:

```
mapping=dict(zip(le.classes_,range(len(le.classes_))))
mapping
```

Out[73]:

```
{'C': 0, 'Q': 1, 'S': 2}
```

In [78]:

```
df.Embarked.value_counts()
```

Out[78]:

```
S    646
C    168
Q     77
Name: Embarked, dtype: int64
```

# 8.Feature Scaling

In [69]:

```
from sklearn.preprocessing import MinMaxScaler
ms= MinMaxScaler()
```

In [74]:

```
X_Scaled=pd.DataFrame(ms.fit_transform(X),columns=X.columns)
```

In [75]:

```
X_Scaled.head()
```

Out[75]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Embarked |
|---|---|---|---|---|---|---|---|
| **0** | 0.0 | 1.0 | 1.0 | 0.271174 | 0.125 | 0.0 | 1.0 |
| **1** | 1.0 | 0.0 | 0.0 | 0.472229 | 0.125 | 0.0 | 0.0 |
| **2** | 1.0 | 1.0 | 0.0 | 0.321438 | 0.000 | 0.0 | 1.0 |
| **3** | 1.0 | 0.0 | 0.0 | 0.434531 | 0.125 | 0.0 | 1.0 |
| **4** | 0.0 | 1.0 | 1.0 | 0.434531 | 0.000 | 0.0 | 1.0 |

# 9.Train,test split

In [76]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(X_Scaled,y,test_size =0.2,random_
```

In [77]:

```
print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

```
(712, 7) (179, 7) (712,) (179,)
```