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

In [2]:
```
df=pd.read_csv('https://raw.githubusercontent.com/datasciencedojo/datasets/refs/heads/master/titanic.csv')
```

In [3]:
```
df
```

Out[3]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Embarked |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2500 | NaN | S |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2833 | C85 | C |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9250 | NaN | S |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1000 | C123 | S |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0500 | NaN | S |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **886** | 887 | 0 | 2 | Montvila, Rev. Juozas | male | 27.0 | 0 | 0 | 211536 | 13.0000 | NaN | S |
| **887** | 888 | 1 | 1 | Graham, Miss. Margaret Edith | female | 19.0 | 0 | 0 | 112053 | 30.0000 | B42 | S |
| **888** | 889 | 0 | 3 | Johnston, Miss. Catherine Helen "Carrie" | female | NaN | 1 | 2 | W./C. 6607 | 23.4500 | NaN | S |
| **889** | 890 | 1 | 1 | Behr, Mr. Karl Howell | male | 26.0 | 0 | 0 | 111369 | 30.0000 | C148 | C |
| **890** | 891 | 0 | 3 | Dooley, Mr. Patrick | male | 32.0 | 0 | 0 | 370376 | 7.7500 | NaN | Q |

891 rows × 12 columns

In [4]:
```
df.columns
```

Out[4]:
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'],
      dtype='object')
```

In [5]:
```
df.head(5)
```

Out[5]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Embarked |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 3 | Braund, Mr. Owen Harris | male | 22.0 | 1 | 0 | A/5 21171 | 7.2500 | NaN | S |
| **1** | 2 | 1 | 1 | Cumings, Mrs. John Bradley (Florence Briggs Th... | female | 38.0 | 1 | 0 | PC 17599 | 71.2833 | C85 | C |
| **2** | 3 | 1 | 3 | Heikkinen, Miss. Laina | female | 26.0 | 0 | 0 | STON/O2. 3101282 | 7.9250 | NaN | S |
| **3** | 4 | 1 | 1 | Futrelle, Mrs. Jacques Heath (Lily May Peel) | female | 35.0 | 1 | 0 | 113803 | 53.1000 | C123 | S |
| **4** | 5 | 0 | 3 | Allen, Mr. William Henry | male | 35.0 | 0 | 0 | 373450 | 8.0500 | NaN | S |

In [6]:
```
df.sample(5)
```

Out[6]:

| | PassengerId | Survived | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Embarked |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **420** | 421 | 0 | 3 | Gheorgheff, Mr. Stanio | male | NaN | 0 | 0 | 349254 | 7.8958 | NaN | C |
| **749** | 750 | 0 | 3 | Connaghton, Mr. Michael | male | 31.0 | 0 | 0 | 335097 | 7.7500 | NaN | Q |
| **652** | 653 | 0 | 3 | Kalvik, Mr. Johannes Halvorsen | male | 21.0 | 0 | 0 | 8475 | 8.4333 | NaN | S |
| **156** | 157 | 1 | 3 | Gilnagh, Miss. Katherine "Katie" | female | 16.0 | 0 | 0 | 35851 | 7.7333 | NaN | Q |
| **575** | 576 | 0 | 3 | Patchett, Mr. George | male | 19.0 | 0 | 0 | 358585 | 14.5000 | NaN | S |

In [7]:
```
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 [8]:
```
df.describe()
```

Out[8]:

| | 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 [9]:
```
df.describe(include="object")
```

Out[9]:

| | Name | Sex | Ticket | Cabin | Embarked |
|---|---|---|---|---|---|
| **count** | 891 | 891 | 891 | 204 | 889 |
| **unique** | 891 | 2 | 681 | 147 | 3 |
| **top** | Dooley, Mr. Patrick | male | 347082 | G6 | S |
| **freq** | 1 | 577 | 7 | 4 | 644 |

In [10]:
```
#Drope Unnecessary Columns
df1=df.drop(["PassengerId","Cabin","Name","Ticket"],axis=1)
df1
```

Out[10]:

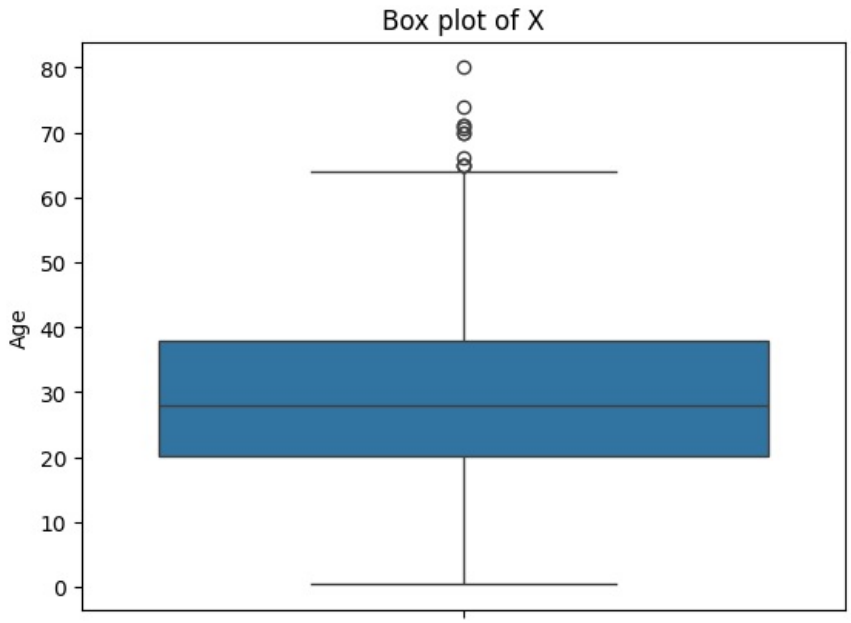
| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **886** | 0 | 2 | male | 27.0 | 0 | 0 | 13.0000 | S |
| **887** | 1 | 1 | female | 19.0 | 0 | 0 | 30.0000 | S |
| **888** | 0 | 3 | female | NaN | 1 | 2 | 23.4500 | S |
| **889** | 1 | 1 | male | 26.0 | 0 | 0 | 30.0000 | C |
| **890** | 0 | 3 | male | 32.0 | 0 | 0 | 7.7500 | Q |

891 rows × 8 columns

In [11]:
```
df1.isna().sum()
```

Out[11]:
```
Survived      0
Pclass        0
Sex           0
Age         177
SibSp         0
Parch         0
Fare          0
Embarked      2
dtype: int64
```

In [12]:
```
#Check Age outliers

sns.boxplot(df1["Age"])
plt.title("Box plot of X")
plt.show()
```




In [13]:
```
df1["Embarked"].value_counts()
```

Out[13]:
```
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
```

In [14]:
```
df1["Age"]
```

Out[14]:
```
0      22.0
1      38.0
2      26.0
3      35.0
4      35.0
       ...
886    27.0
887    19.0
888     NaN
889    26.0
890    32.0
Name: Age, Length: 891, dtype: float64
```

In [15]:
```
#Handling Null Values with median and mode

df1["Age"]=df1["Age"].fillna(df["Age"].median())
df1["Embarked"]=df1["Embarked"].fillna(df["Embarked"].mode()[0])

df1
```

Out[15]:

| | 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 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **886** | 0 | 2 | male | 27.0 | 0 | 0 | 13.0000 | S |
| **887** | 1 | 1 | female | 19.0 | 0 | 0 | 30.0000 | S |
| **888** | 0 | 3 | female | 28.0 | 1 | 2 | 23.4500 | S |
| **889** | 1 | 1 | male | 26.0 | 0 | 0 | 30.0000 | C |
| **890** | 0 | 3 | male | 32.0 | 0 | 0 | 7.7500 | Q |

891 rows × 8 columns

In [16]:
```
df1.isna().sum()
```

Out[16]:
```
Survived    0
Pclass      0
Sex         0
Age         0
SibSp       0
Parch       0
Fare        0
Embarked    0
dtype: int64
```

In [17]:
```
#Feature Binning

df1["Age_group"]=pd.cut(df1["Age"],bins=[0,18,35,65,85],labels=["Child","Adult","Senior","Most Senior"])
df1
```

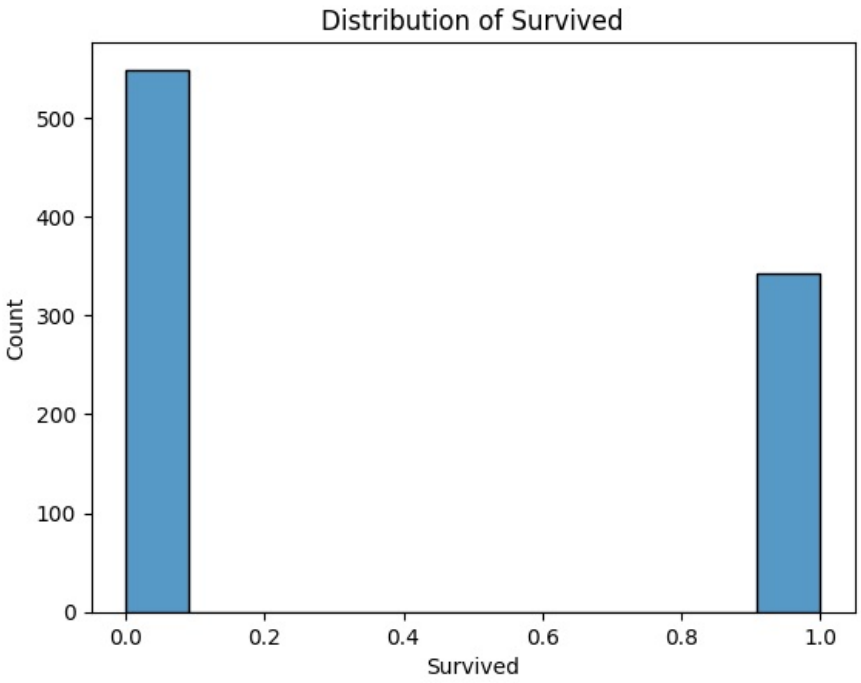
Out[17]:

| | Survived | Pclass | Sex | Age | SibSp | Parch | Fare | Embarked | Age_group |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S | Adult |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C | Senior |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S | Adult |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S | Adult |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S | Adult |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **886** | 0 | 2 | male | 27.0 | 0 | 0 | 13.0000 | S | Adult |
| **887** | 1 | 1 | female | 19.0 | 0 | 0 | 30.0000 | S | Adult |
| **888** | 0 | 3 | female | 28.0 | 1 | 2 | 23.4500 | S | Adult |
| **889** | 1 | 1 | male | 26.0 | 0 | 0 | 30.0000 | C | Adult |
| **890** | 0 | 3 | male | 32.0 | 0 | 0 | 7.7500 | Q | Adult |

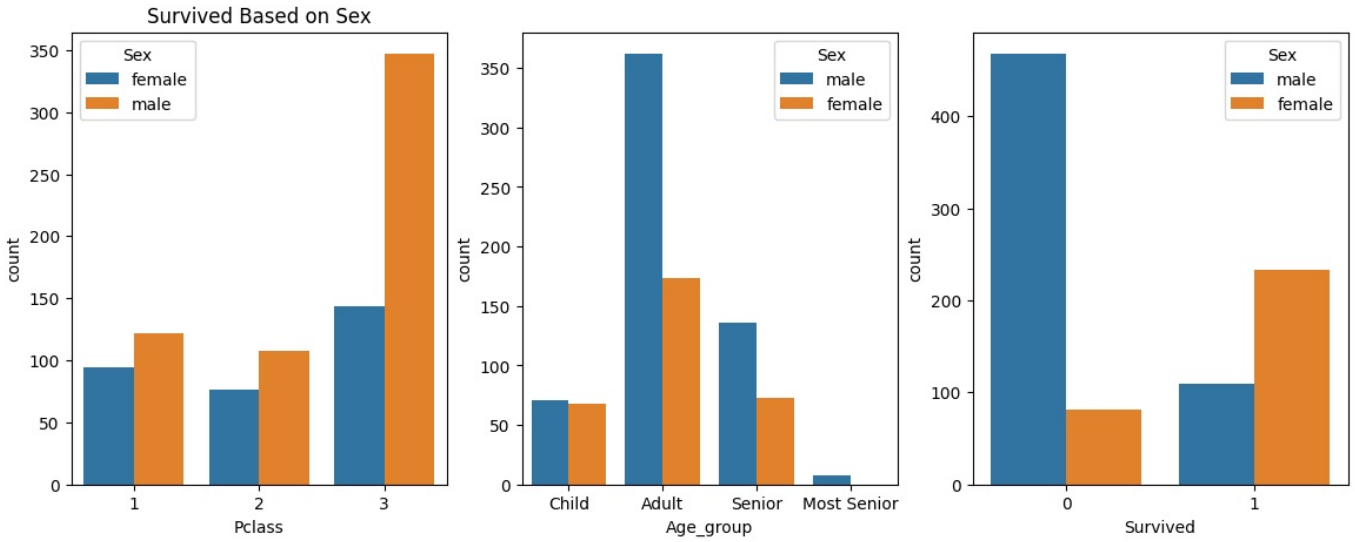
891 rows × 9 columns

In [18]:
```
# Visualization of this Data
```

In [19]:
```
sns.histplot(x="Survived",data=df1)
plt.title("Distribution of Survived")
plt.show()
```



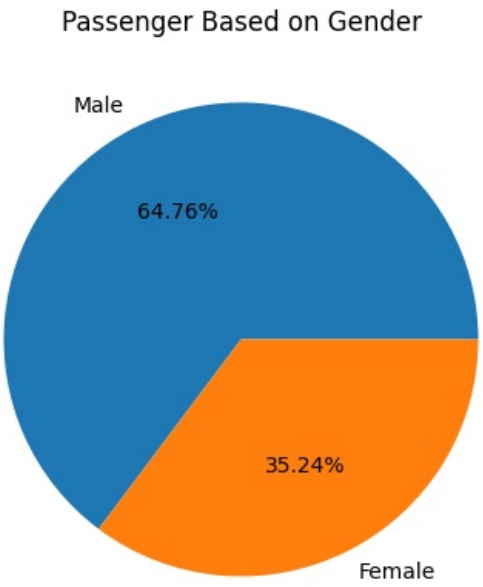

In [20]:
```
fig,ax=plt.subplots(1,3,figsize=(14,5))
sns.countplot(x="Pclass",data=df,hue="Sex",ax=ax[0])
sns.countplot(x="Age_group",data=df1,hue="Sex",ax=ax[1])
sns.countplot(x="Survived",data=df1,hue="Sex",ax=ax[2])
ax[0].set_title("PClass Based on Sex")
ax[0].set_title("Age Group Based on Sex")
ax[0].set_title("Survived Based on Sex")
plt.show()
```




In [21]:
```
sex_count=df["Sex"].value_counts()
sex_count
```

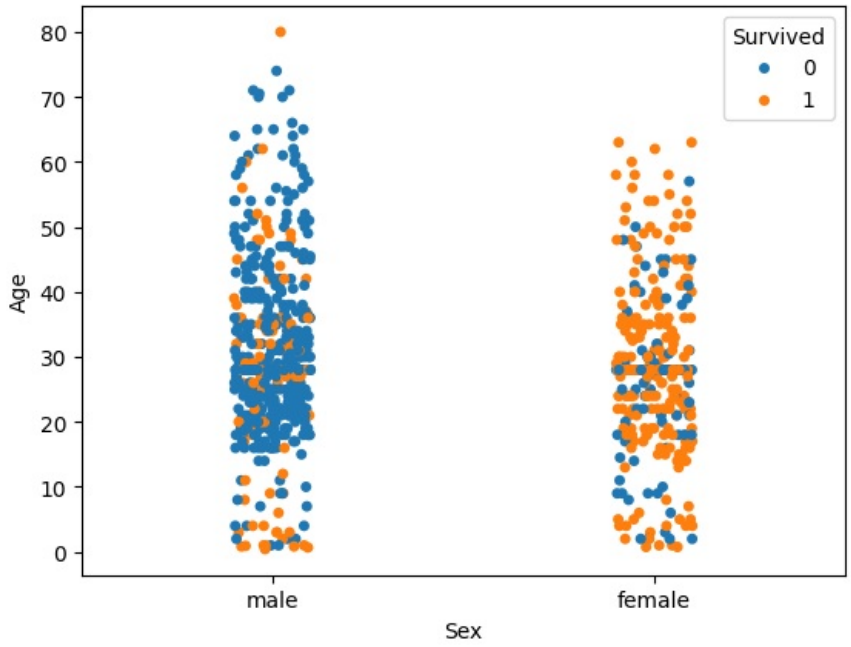
Out[21]:
```
Sex
male      577
female    314
Name: count, dtype: int64
```

In [22]:
```
plt.figure(figsize=(10,5))
plt.pie(sex_count,labels=["Male","Female"],autopct='%1.2f%%')
plt.title("Passenger Based on Gender")
plt.show()
```



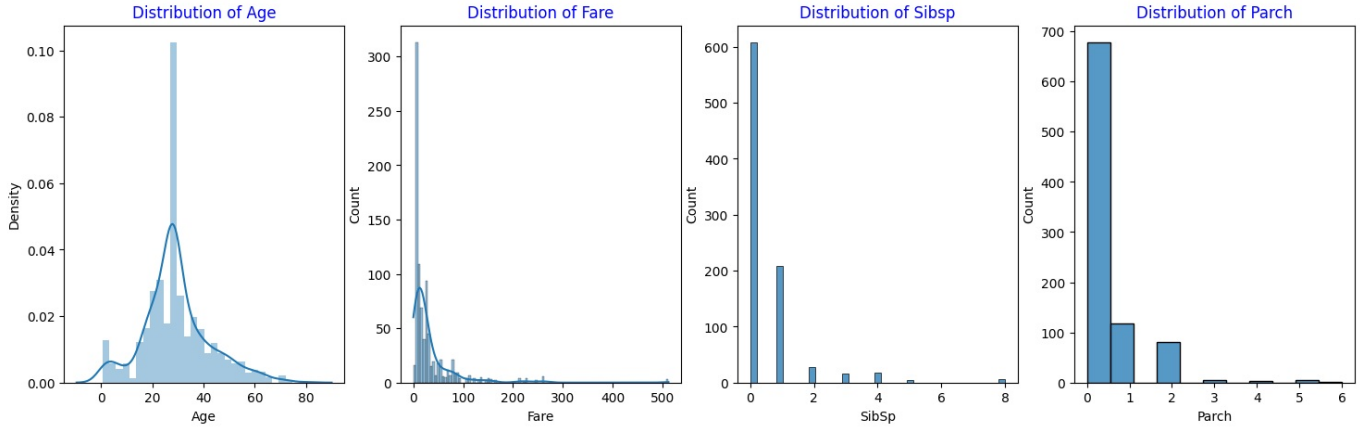

In [23]:
```
sns.stripplot(x="Sex",y="Age",data=df1,hue="Survived")
```

Out[23]:
```
<Axes: xlabel='Sex', ylabel='Age'>
```

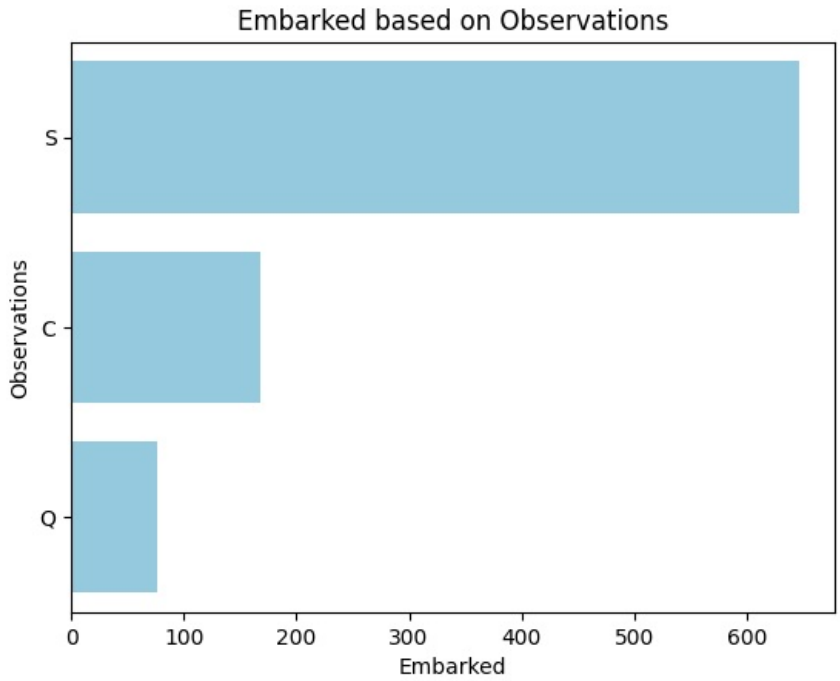



In [24]:
```
fig,ax=plt.subplots(1,4,figsize=(18,5))
sns.distplot(df1["Age"],ax=ax[0])
sns.histplot(df1["Fare"],ax=ax[1],kde=True)
sns.histplot(df1["SibSp"],ax=ax[2])
sns.histplot(df1["Parch"],ax=ax[3])


ax[0].set_title("Distribution of Age",color="Blue")
ax[1].set_title("Distribution of Fare",color="Blue")
ax[2].set_title("Distribution of Sibsp",color="Blue")
ax[3].set_title("Distribution of Parch",color="Blue")
plt.show()
```

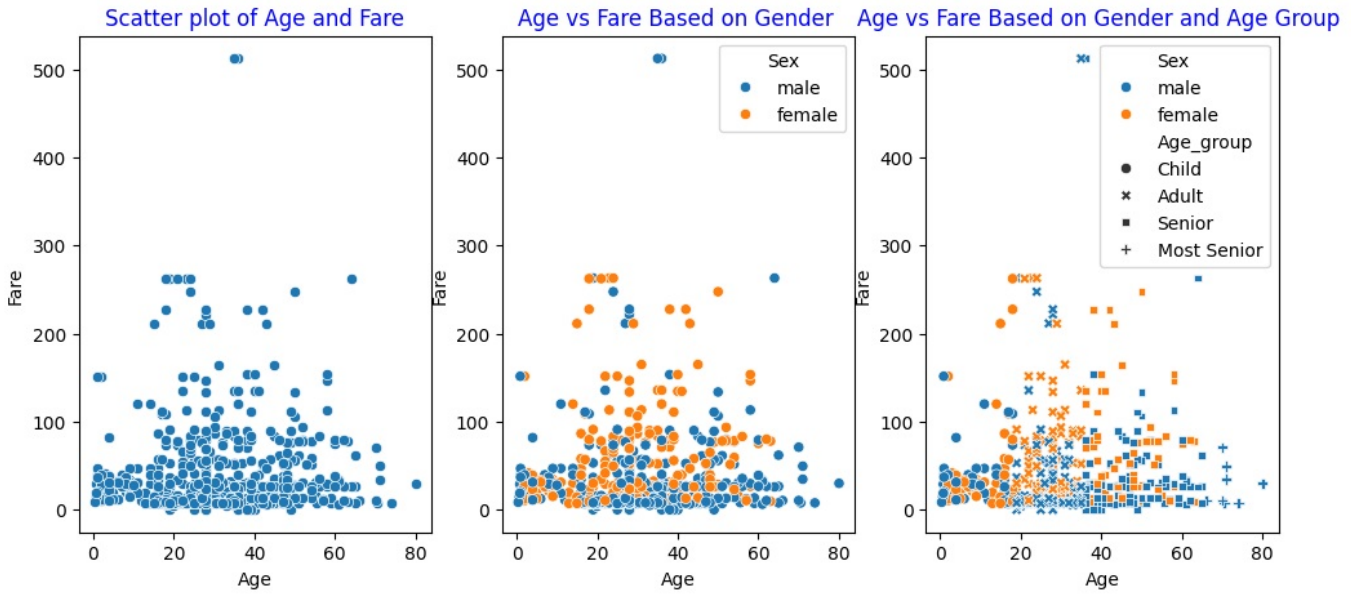
```
/tmp/ipykernel_82030/2831472293.py:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df1["Age"],ax=ax[0])
```




In [25]:
```
sns.countplot(df1["Embarked"],color="skyblue")
plt.title("Embarked based on Observations")
plt.xlabel("Embarked")
plt.ylabel("Observations")
plt.show()
```

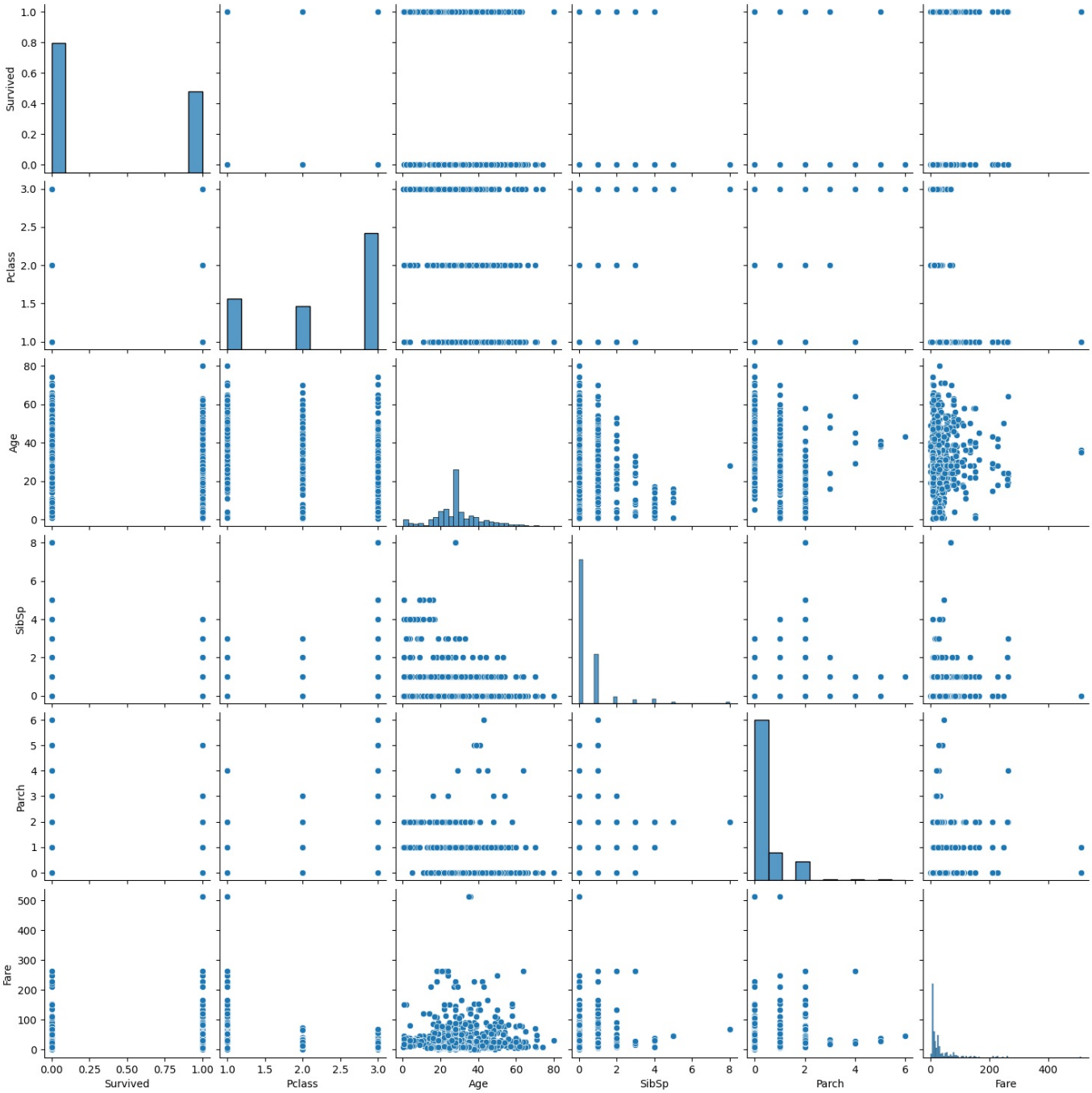



In [26]:
```
fig,ax=plt.subplots(1,3,figsize=(12,5))
sns.scatterplot(x="Age",y="Fare",data=df1,ax=ax[0])
sns.scatterplot(x="Age",y="Fare",data=df1,hue="Sex",ax=ax[1])
sns.scatterplot(x="Age",y="Fare",data=df1,hue="Sex",style="Age_group",ax=ax[2])
ax[0].set_title("Scatter plot of Age and Fare",color="Blue")
ax[1].set_title("Age vs Fare Based on Gender ",color="Blue")
ax[2].set_title("Age vs Fare Based on Gender and Age Group ",color="Blue")
plt.show()
```




In [27]:
```
sns.pairplot(df1)
```

Out[27]:
```
<seaborn.axisgrid.PairGrid at 0x75a3fa724680>
```




In [28]:
```
num_col=["Survived",    "Pclass","Age"   ,"SibSp",       "Parch",       "Fare"]
num_col
```

Out[28]: ['Survived', 'Pclass', 'Age', 'SibSp', 'Parch', 'Fare']

In [29]:
```
cor=df1[num_col].corr()
cor
```

Out[29]:

| | Survived | Pclass | Age | SibSp | Parch | Fare |
|---|---|---|---|---|---|---|
| **Survived** | 1.000000 | -0.338481 | -0.064910 | -0.035322 | 0.081629 | 0.257307 |
| **Pclass** | -0.338481 | 1.000000 | -0.339898 | 0.083081 | 0.018443 | -0.549500 |
| **Age** | -0.064910 | -0.339898 | 1.000000 | -0.233296 | -0.172482 | 0.096688 |
| **SibSp** | -0.035322 | 0.083081 | -0.233296 | 1.000000 | 0.414838 | 0.159651 |
| **Parch** | 0.081629 | 0.018443 | -0.172482 | 0.414838 | 1.000000 | 0.216225 |
| **Fare** | 0.257307 | -0.549500 | 0.096688 | 0.159651 | 0.216225 | 1.000000 |

In [30]:
```
sns.heatmap(cor,annot=True)
```

Out[30]: <Axes: >