PROBLEM STATEMENT:To predict and analyze which gender has a high chance of survival at the time of disaster

In [1]:
```
import numpy as np
import pandas as pd
from sklearn import preprocessing
import matplotlib.pyplot as plt
import seaborn as sns
sns.set(style="white")
sns.set(style="whitegrid",color_codes=True)
import warnings
warnings.simplefilter(action="ignore")
```

In [2]:
```
train_df=pd.read_csv(r"C:\Users\USER\Downloads\train.gender_submission.csv")
train_df
```

Out[2]:

	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 [3]:
```
test_df=pd.read_csv(r"C:\Users\USER\Downloads\test.gender_submission.csv")
test_df
```

Out[3]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S
...	...	...	...	...	...	...	...	...	...	...	...
413	1305	3	Spector, Mr. Woolf	male	NaN	0	0	A.5. 3236	8.0500	NaN	S
414	1306	1	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758	108.9000	C105	C
415	1307	3	Saether, Mr. Simon Sivertsen	male	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	S
416	1308	3	Ware, Mr. Frederick	male	NaN	0	0	359309	8.0500	NaN	S
417	1309	3	Peter, Master. Michael J	male	NaN	1	1	2668	22.3583	NaN	C

418 rows × 11 columns

In [4]:
```
train_df.head(10)
```

Out[4]:

	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
5	6	0	3	Moran, Mr. James	male	NaN	0	0	330877	8.4583	NaN	Q
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.8625	E46	S
7	8	0	3	Palsson, Master. Gosta Leonard	male	2.0	3	1	349909	21.0750	NaN	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.1333	NaN	S
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.0	1	0	237736	30.0708	NaN	C

In [5]:
```
train_df.shape
```

Out[5]: (891, 12)

In [6]:
```
test_df.head(10)
```

Out[6]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S
5	897	3	Svensson, Mr. Johan Cervin	male	14.0	0	0	7538	9.2250	NaN	S
6	898	3	Connolly, Miss. Kate	female	30.0	0	0	330972	7.6292	NaN	Q
7	899	2	Caldwell, Mr. Albert Francis	male	26.0	1	1	248738	29.0000	NaN	S
8	900	3	Abrahim, Mrs. Joseph (Sophie Halaut Easu)	female	18.0	0	0	2657	7.2292	NaN	C
9	901	3	Davies, Mr. John Samuel	male	21.0	2	0	A/4 48871	24.1500	NaN	S

In [7]:
```
test_df.shape
```

Out[7]:
```
(418, 11)
```

In [8]:
```
train_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]:
```
train_df.info
```

Out[9]:
```
<bound method DataFrame.info of      PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                 Name     Sex   Age  SibSp  \
0                             Braund, Mr. Owen Harris    male  22.0      1
1   Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0      1
2                              Heikkinen, Miss. Laina  female  26.0      0
3        Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1
4                            Allen, Mr. William Henry    male  35.0      0
..                                                ...     ...   ...    ...
886                            Montvila, Rev. Juozas    male  27.0      0
887                     Graham, Miss. Margaret Edith  female  19.0      0
888         Johnston, Miss. Catherine Helen "Carrie"  female   NaN      1
889                            Behr, Mr. Karl Howell    male  26.0      0
890                              Dooley, Mr. Patrick    male  32.0      0

     Parch            Ticket     Fare Cabin Embarked
0        0         A/5 21171   7.2500   NaN        S
1        0          PC 17599  71.2833   C85        C
2        0  STON/O2. 3101282   7.9250   NaN        S
3        0            113803  53.1000  C123        S
4        0            373450   8.0500   NaN        S
..     ...               ...      ...   ...      ...
886      0            211536  13.0000   NaN        S
887      0            112053  30.0000   B42        S
888      2        W./C. 6607  23.4500   NaN        S
889      0            111369  30.0000  C148        C
890      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]>
```

In [10]:
```
test_df.describe()
```

Out[10]:

	PassengerId	Pclass	Age	SibSp	Parch	Fare
count	418.000000	418.000000	332.000000	418.000000	418.000000	417.000000
mean	1100.500000	2.265550	30.272590	0.447368	0.392344	35.627188
std	120.810458	0.841838	14.181209	0.896760	0.981429	55.907576
min	892.000000	1.000000	0.170000	0.000000	0.000000	0.000000
25%	996.250000	1.000000	21.000000	0.000000	0.000000	7.895800
50%	1100.500000	3.000000	27.000000	0.000000	0.000000	14.454200
75%	1204.750000	3.000000	39.000000	1.000000	0.000000	31.500000
max	1309.000000	3.000000	76.000000	8.000000	9.000000	512.329200

In [11]:
```
test_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(5)
memory usage: 36.1+ KB
```

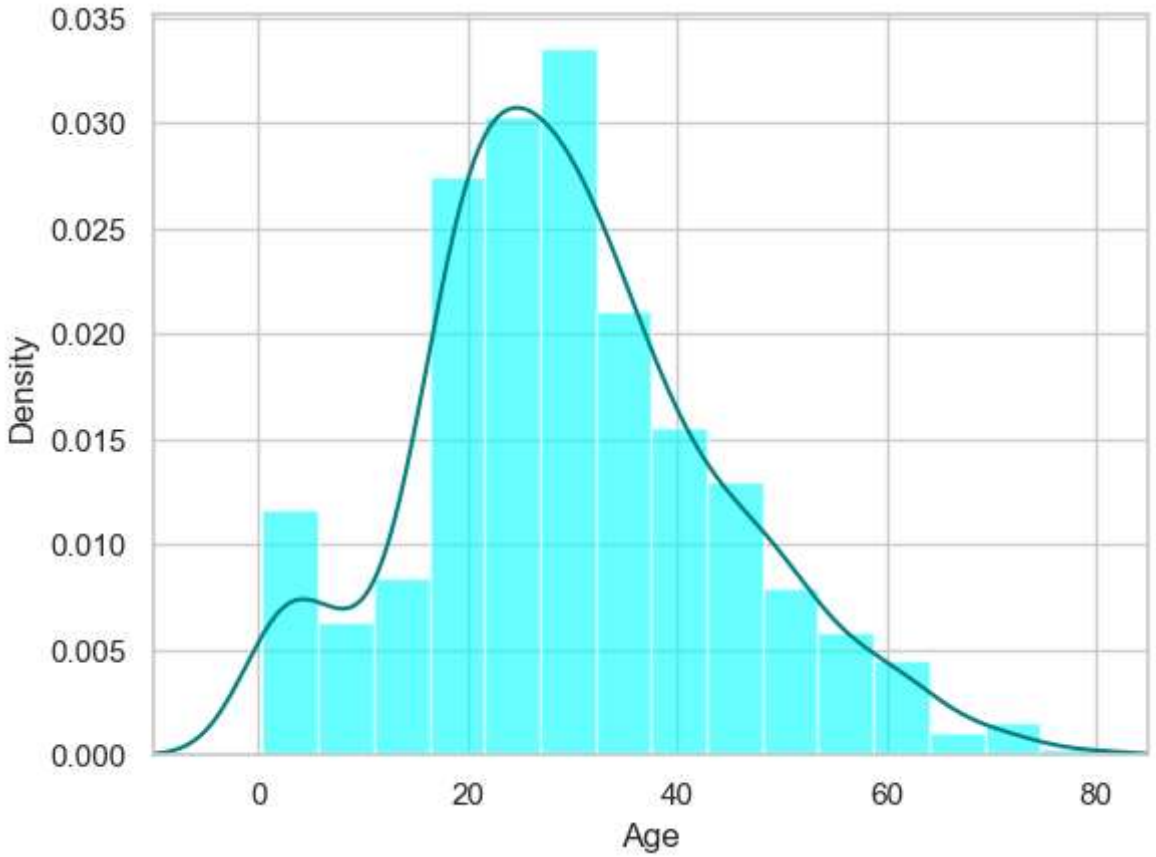
In [12]:
```
train_df.isnull().sum()
```

Out[12]:
```
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 [13]:
```
test_df.isnull().sum()
```

Out[13]:
```
PassengerId      0
Pclass           0
Name             0
Sex              0
Age             86
SibSp            0
Parch            0
Ticket           0
Fare             1
Cabin          327
Embarked         0
dtype: int64
```

In [14]:
```
ax=train_df['Age'].hist(bins=15,density=True,stacked=True,color='cyan',alpha=0.6)
train_df['Age'].plot(kind='density',color='teal')
ax.set(xlabel='Age')
plt.xlim(-10,85)
plt.show()
```

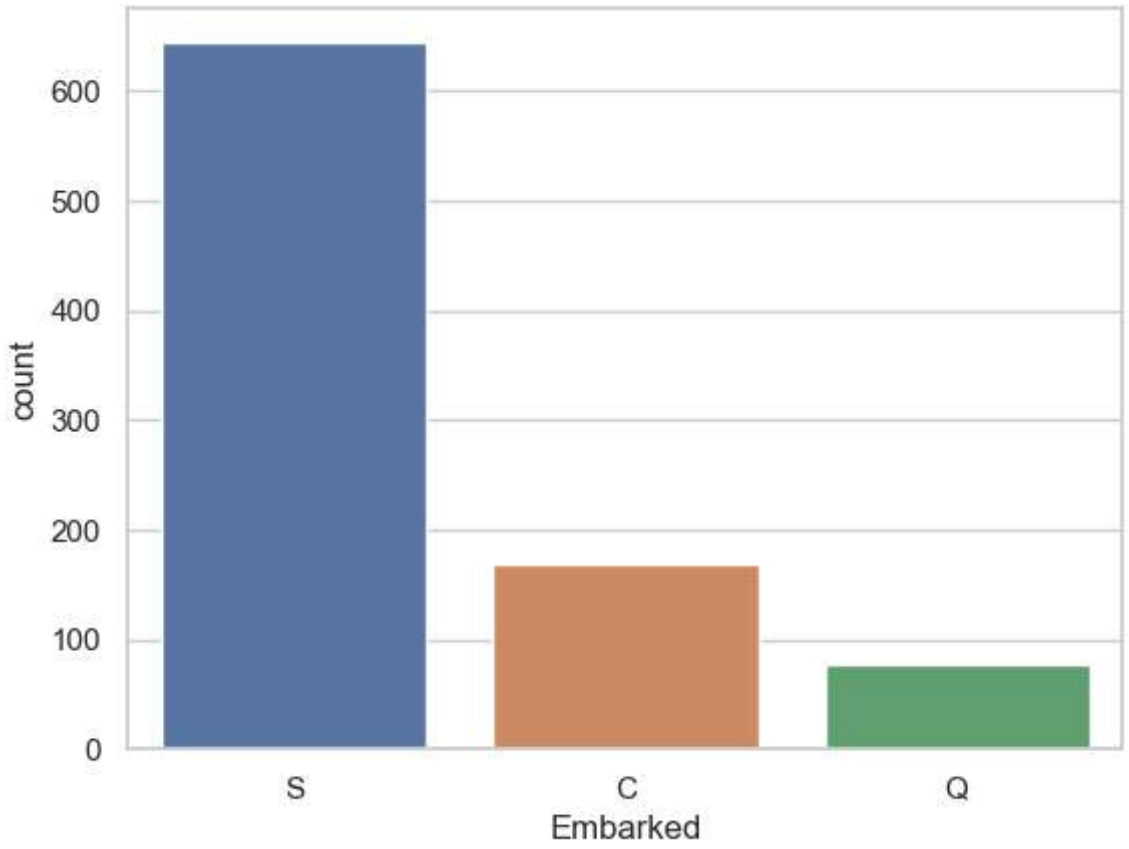


In [15]:
```
print(train_df['Age'].mean(skipna=True))
print(train_df['Age'].median(skipna=True))
print((train_df['Cabin'].isnull().sum()/train_df.shape[0])*100)
print((train_df['Embarked'].isnull().sum()/train_df.shape[0])*100)
```

```
29.69911764705882
28.0
77.10437710437711
0.22446689113355783
```

In [16]:
```
print('Boarded passengers grouped by port of embarkation(C=Cherbourg,Q=Queenstown,S=Southsmpton):')
print(train_df['Embarked'].value_counts())
sns.countplot(x='Embarked',data=train_df)
plt.show()
```

```
Boarded passengers grouped by port of embarkation(C=Cherbourg,Q=Queenstown,S=Southsmpton):
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
```



In [17]:
```
print(train_df['Embarked'].value_counts().idxmax())
```

```
S
```

In [18]:
```
train_data=train_df.copy()
```

In [19]:
```
train_data['Age'].fillna(train_df['Age'].median(skipna=True),inplace=True)
train_data['Embarked'].fillna(train_df['Embarked'].value_counts().idxmax(), inplace=True)
train_data.drop('Cabin',axis=1, inplace=True)
```

In [20]:
```
train_data.isnull().sum()
```

Out[20]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

In [21]:
```
train_data.head()
```

Out[21]:

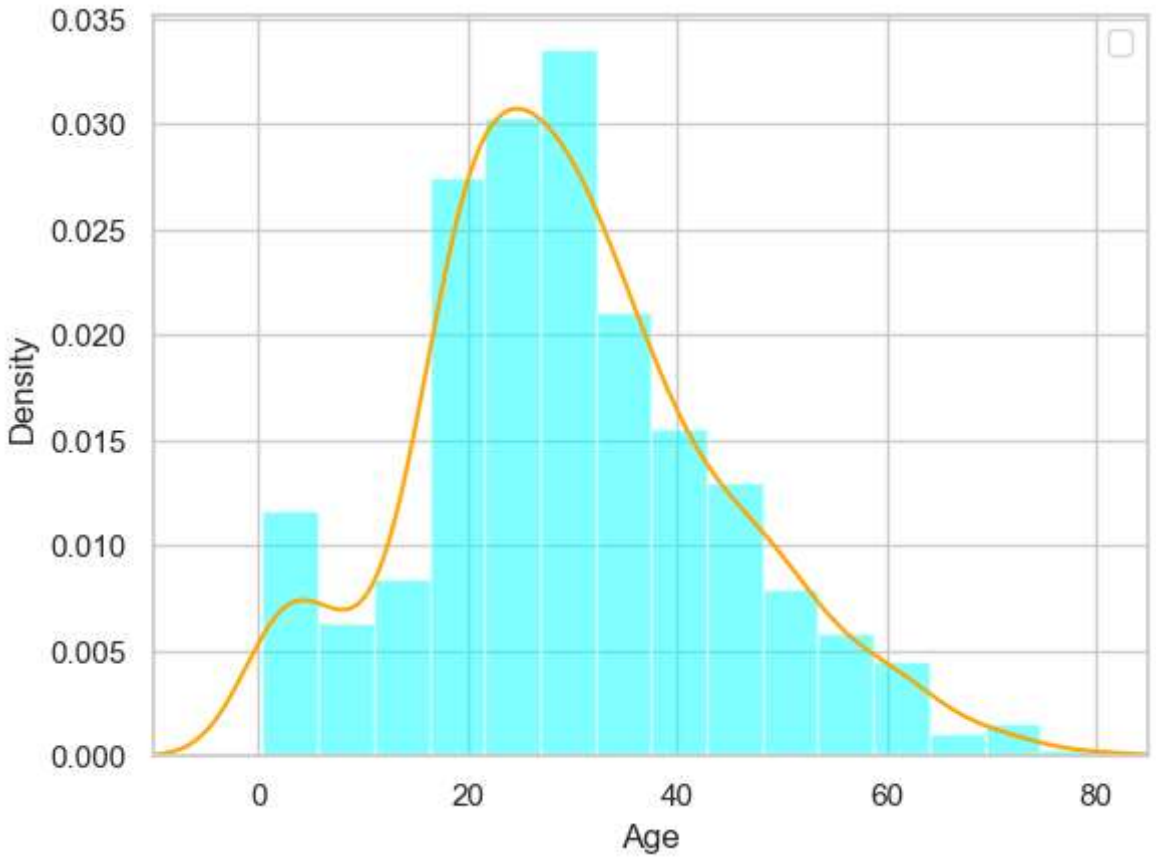
	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250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

In [22]:
```
plt.figure(figsize=(15,8))
```

Out[22]:
```
<Figure size 1500x800 with 0 Axes>
```

```
<Figure size 1500x800 with 0 Axes>
```

In [23]:
```
ax=train_df['Age'].hist(bins=15,density=True,stacked=True,color='cyan',alpha=0.5)
train_df['Age'].plot(kind='density',color='orange')
ax.legend('Raw Age','Adjusted Age')
ax.set(xlabel='Age')
plt.xlim(-10,85)
plt.show()
```



In [24]:
```
train_data['TravelAlone']=np.where((train_data['SibSp']+train_data['Parch'])>0,0,1)
train_data.drop('SibSp',axis=1, inplace=True)
train_data.drop('Parch',axis=1, inplace=True)
training=pd.get_dummies(train_data,columns=['Pclass','Embarked','Sex'])
training.drop('Sex_female',axis=1, inplace=True)
training.drop('PassengerId',axis=1, inplace=True)
training.drop('Name',axis=1, inplace=True)
training.drop('Ticket',axis=1, inplace=True)

final_train=training
final_train.head()
```

Out[24]:

	Survived	Age	Fare	TravelAlone	Pclass_1	Pclass_2	Pclass_3	Embarked_C	Embarked_Q	Embarked_S	Sex_male
0	0	22.0	7.2500	0	False	False	True	False	False	True	True
1	1	38.0	71.2833	0	True	False	False	True	False	False	False
2	1	26.0	7.9250	1	False	False	True	False	False	True	False
3	1	35.0	53.1000	0	True	False	False	False	False	True	False
4	0	35.0	8.0500	1	False	False	True	False	False	True	True

In [25]:
```
test_df.isnull().sum()
```

Out[25]:
```
PassengerId      0
Pclass           0
Name             0
Sex              0
Age             86
SibSp            0
Parch            0
Ticket           0
Fare             1
Cabin          327
Embarked         0
dtype: int64
```

In [29]:
```
test_data=test_df.copy()
```

In [30]:
```
test_data['Age'].fillna(train_df['Age'].median(skipna=True),inplace=True)
test_data['Fare'].fillna(train_df['Fare'].median(skipna=True),inplace=True)
test_data.drop('Cabin',axis=1, inplace=True)
test_data['Travel Alone']=np.where((train_data['SibSp']+train_data['Parch'])>0,0,1)
test_data.drop('SibSp',axis=1, inplace=True)
test_data.drop('Parch',axis=1, inplace=True)
testing=pd.get_dummies(train_data,columns=['Pclass','Embarked','Sex'])
testing.drop('Sex_female',axis=1, inplace=True)
testing.drop('PassengerId',axis=1, inplace=True)
testing.drop('Name',axis=1, inplace=True)
testing.drop('Ticket',axis=1, inplace=True)
final_test=testing
final_test.head()
```

Out[30]:

	Age	SibSp	Parch	Fare	Cabin	Pclass_1	Pclass_2	Pclass_3	Embarked_C	Embarked_Q	Embarked_S	Sex_male
0	34.5	0	0	7.8292	NaN	False	False	True	False	True	False	True
1	47.0	1	0	7.0000	NaN	False	False	True	False	False	True	False
2	62.0	0	0	9.6875	NaN	False	True	False	False	True	False	True
3	27.0	0	0	8.6625	NaN	False	False	True	False	False	True	True
4	22.0	1	1	12.2875	NaN	False	False	True	False	False	True	False

In [ ]:
```

```

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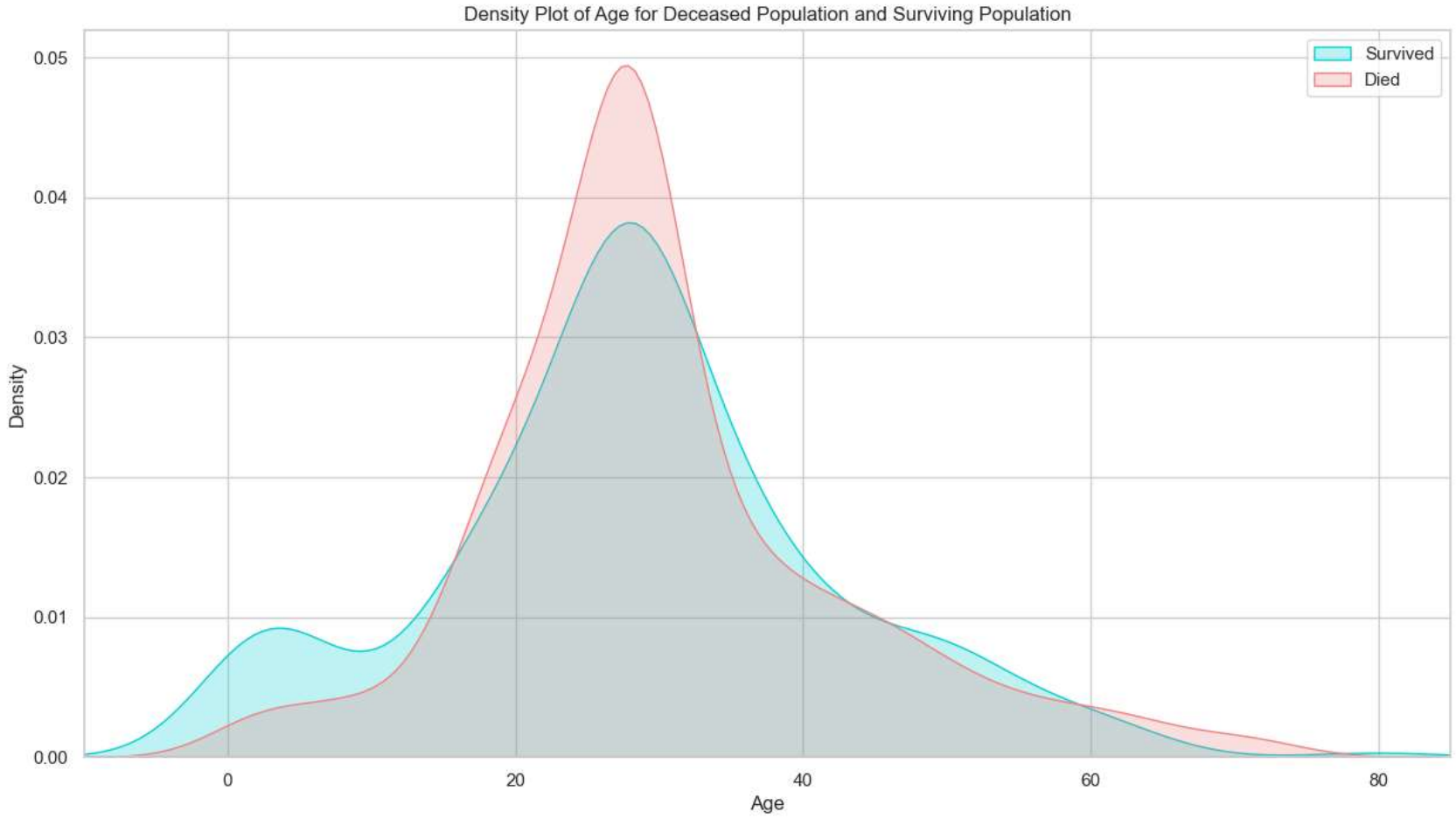
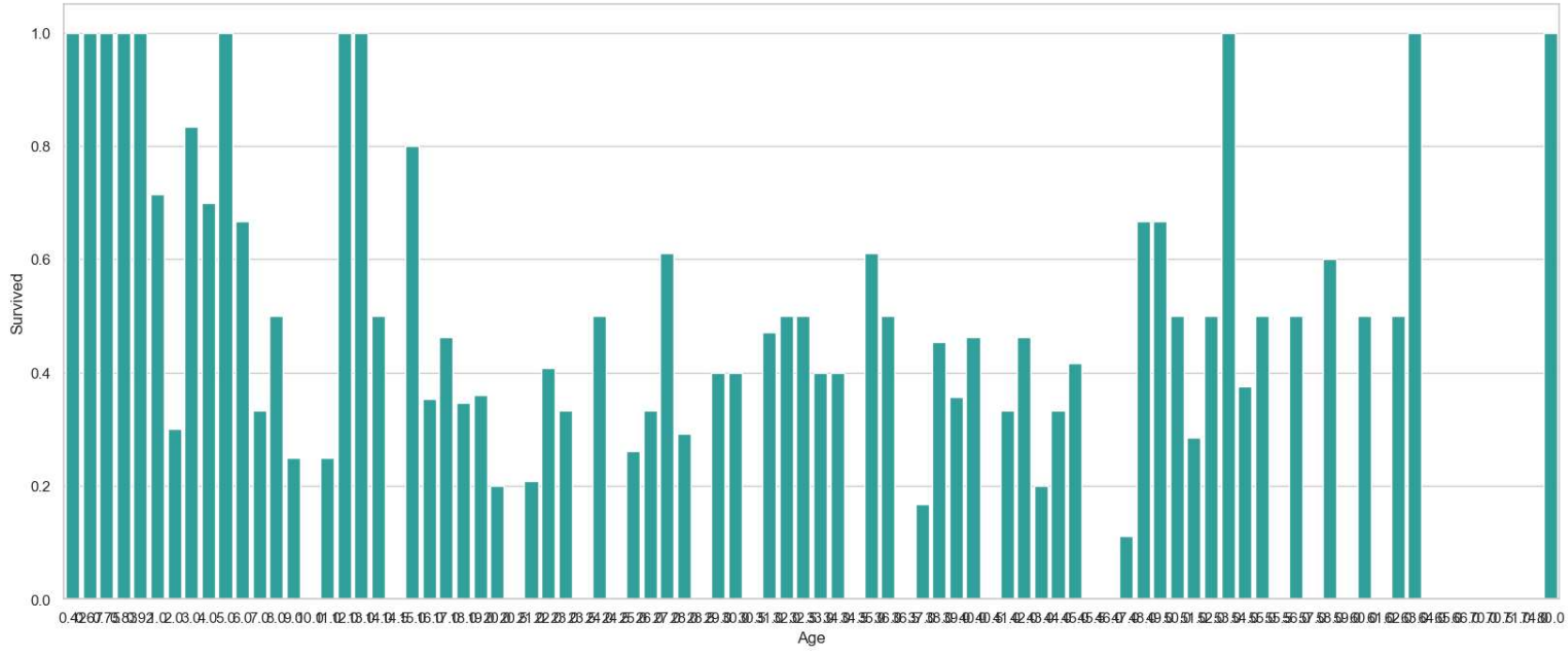
EXPLORATORY DATA ANALYSIS

In [31]:
```
plt.figure(figsize=(15, 8))
ax= sns.kdeplot(final_train['Age'][final_train.Survived == 1], color='darkturquoise', shade=True)
sns.kdeplot(final_train['Age'][final_train.Survived == 0], color='lightcoral', shade=True)
plt.legend(['Survived','Died'])
plt.title('Density Plot of Age for Deceased Population and Surviving Population')
ax.set(xlabel='Age')
plt.xlim(-10, 85)
plt.show()
```



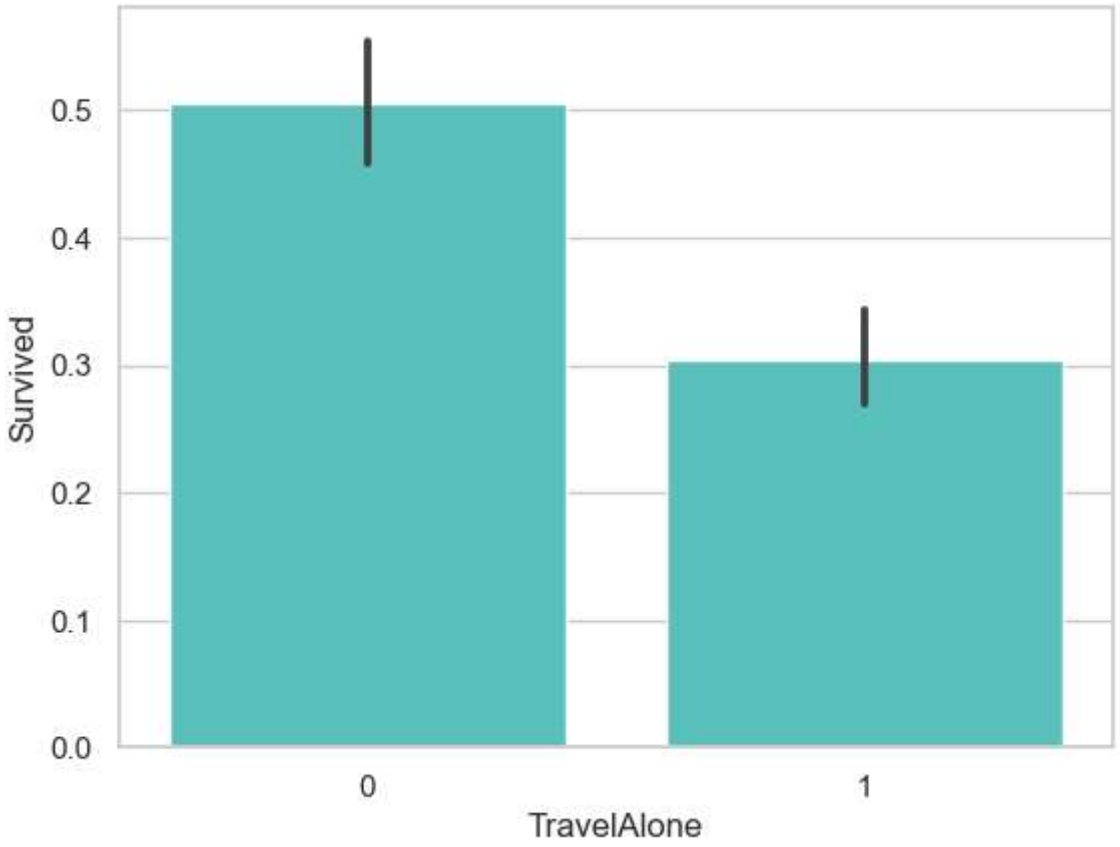
In [32]:
```
plt.figure(figsize=(20,8))
avg_survival_byage = final_train[['Age','Survived']].groupby(['Age'],as_index=False).mean()
g=sns.barplot(x='Age',y='Survived',data=avg_survival_byage,color="LightSeaGreen")
plt.show()
```



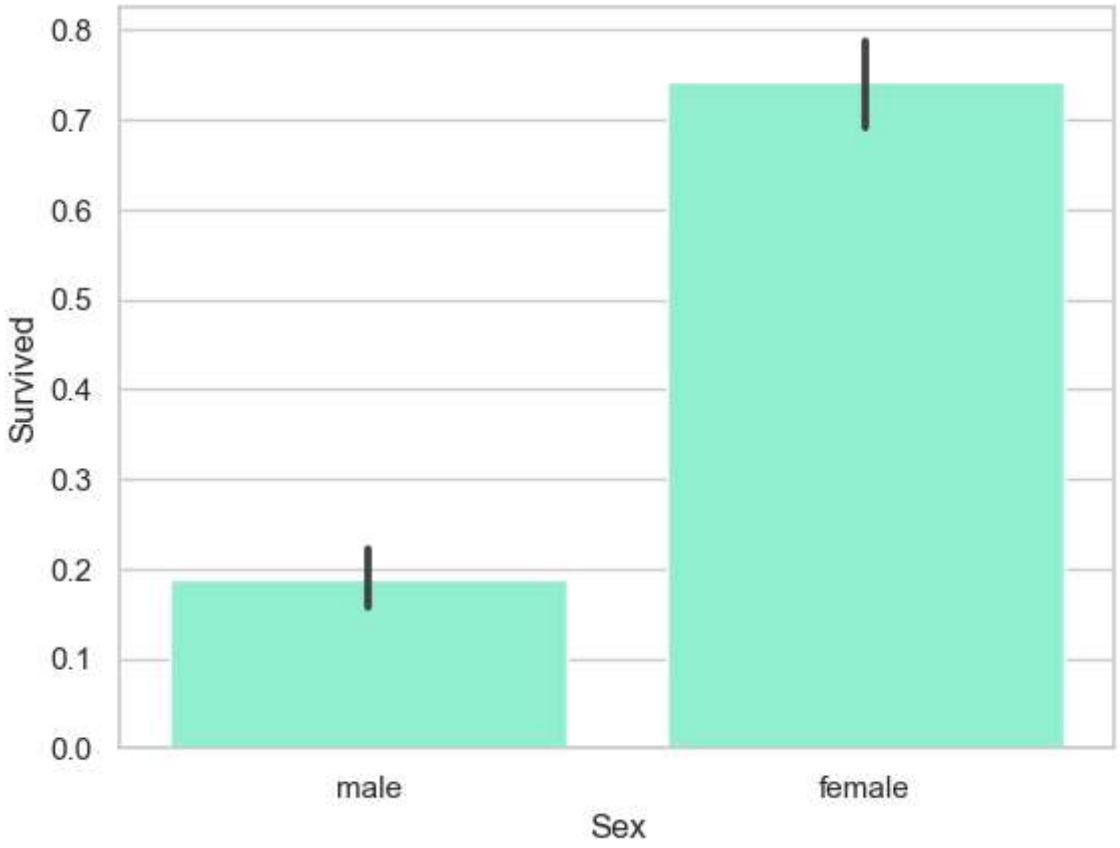
In [33]:
```
final_test['IsMinor']=np.where(final_test['Age']<=16,1,0)
print(final_test['IsMinor'])
```

```
0      0
1      0
2      0
3      0
4      0
      ..
413    0
414    0
415    0
416    0
417    0
Name: IsMinor, Length: 418, dtype: int32
```

In [34]:
```
sns.barplot(x='TravelAlone',y='Survived',data=final_train,color='mediumturquoise')
plt.show()
```



In [35]:
```
import seaborn as sna
import matplotlib.pyplot as plt
sns.barplot(x='Sex',y='Survived',data=train_df,color='aquamarine')
plt.show()
```



In [ ]: