In [18]:

```
import pandas as pd
```

In [20]:

```
train=pd.read_csv('train.csv')
```

In [21]:

```
train
```

Out[21]:

	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 [22]:

```
test=pd.read_csv('test.csv')
```

In [23]:

```
test
```

Out[23]:

	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 [24]:

```
train.head(5)
```

Out[24]:

	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 [25]:

```
train.shape
```

Out[25]:

```
(891, 12)
```

In [26]:

```
test.shape
```

Out[26]:

```
(418, 11)
```

In [28]:

```
train.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 [29]:

```
test.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: 36.0+ KB
```

In [30]:

```
train.isnull().sum()
```

Out[30]:

```
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 [31]:

```
test.isnull().sum()
```

Out[31]:

```
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 [32]:

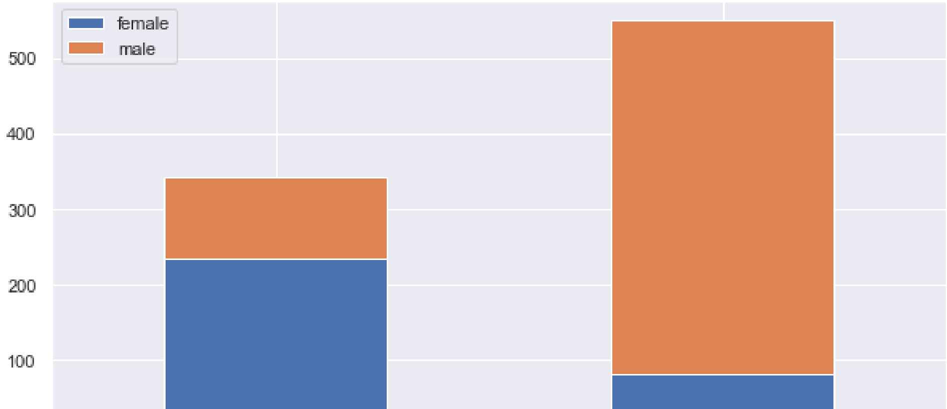
```
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
sns.set()
```

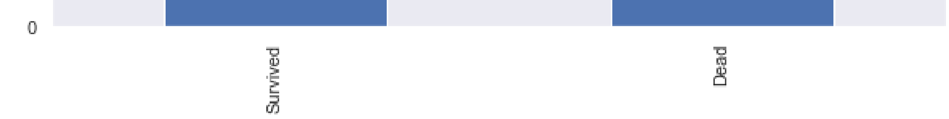
In [33]:

```
def bar_chart(feature):
    survived = train[train['Survived']==1][feature].value_counts()
    dead = train[train['Survived']==0][feature].value_counts()
    df = pd.DataFrame([survived,dead])
    df.index = ['Survived','Dead']
    df.plot(kind='bar',stacked=True, figsize=(10,5))
```

In [35]:

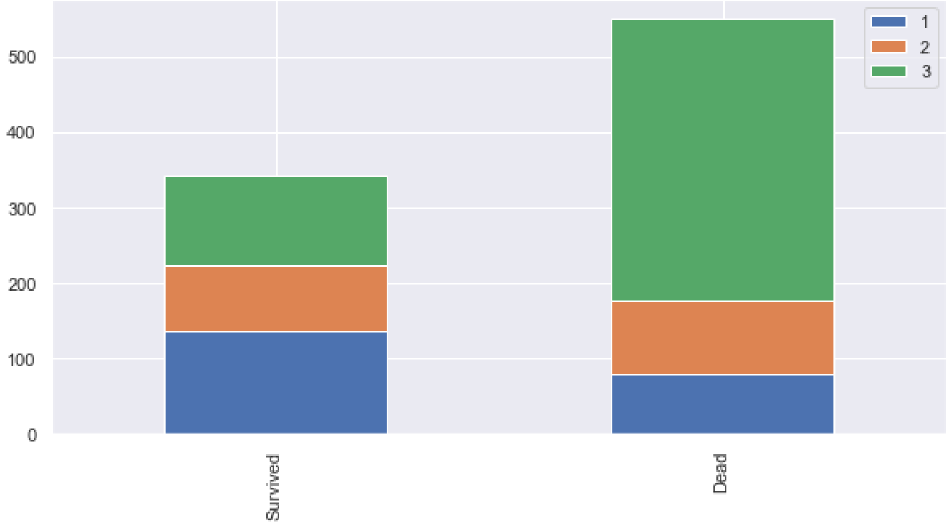
```
bar_chart('Sex')
```





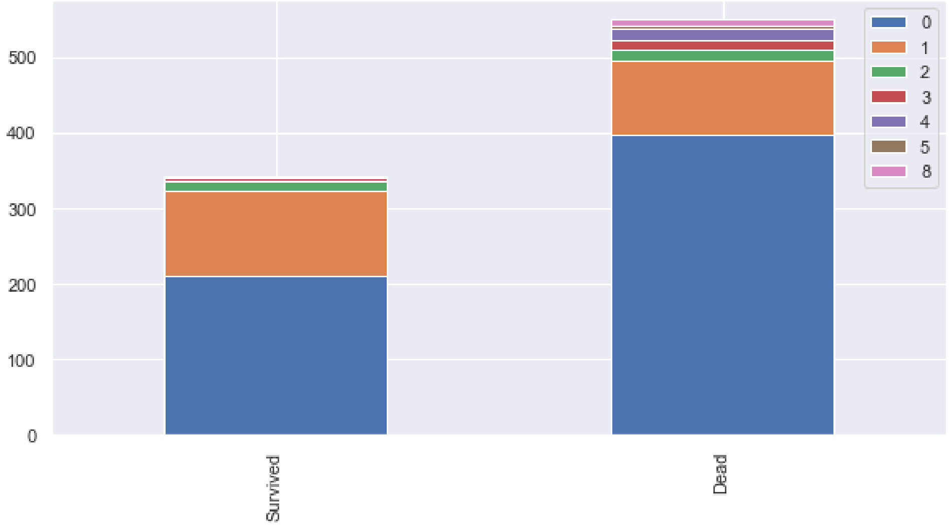
In [37]:

```
bar_chart('Pclass')
```



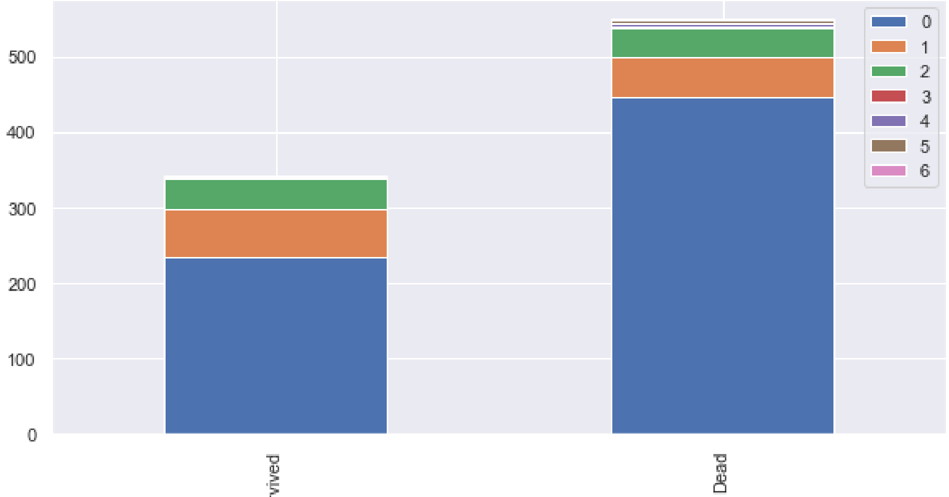
In [38]:

```
bar_chart('SibSp')
```



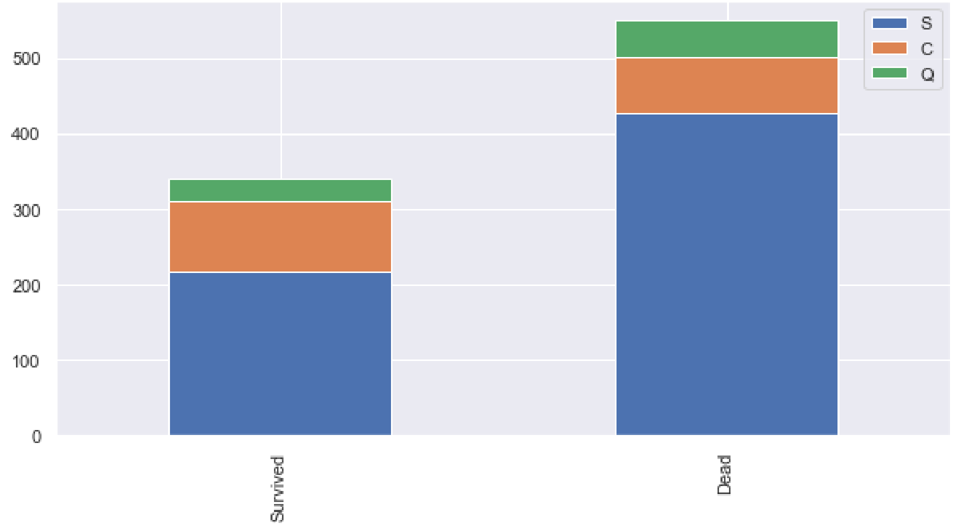
In [39]:

```
bar_chart('Parch')
```



In [40]:

```
bar_chart('Embarked')
```



In [41]:

```
train_test_data = [train, test]

for dataset in train_test_data:
    dataset['Title'] = dataset['Name'].str.extract(' ([A-Za-z]+)\.', expand=False)
```

In [42]:

```
train['Title'].value_counts()
```

Out[42]:

```
Mr          517
Miss        182
Mrs         125
Master       40
Dr            7
Rev           6
Col           2
Mlle          2
Major         2
Capt          1
Ms            1
Countess      1
Lady          1
Don           1
Jonkheer      1
Sir           1
Mme           1
Name: Title, dtype: int64
```

In [43]:

```
test['Title'].value_counts()
```

Out[43]:

```
Mr        240
Miss       78
Mrs        72
Master     21
Col         2
Rev         2
Ms          1
Dr          1
Dona        1
Name: Title, dtype: int64
```

In [44]:

```
title_mapping = {"Mr": 0, "Miss": 1, "Mrs": 2,
                 "Master": 3, "Dr": 3, "Rev": 3, "Col": 3, "Major": 3, "Mlle": 3,"Countess": 3,
                 "Ms": 3, "Lady": 3, "Jonkheer": 3, "Don": 3, "Dona" : 3, "Mme": 3,"Capt": 3,"Sir": 3 }
for dataset in train_test_data:
    dataset['Title'] = dataset['Title'].map(title_mapping)
```

In [45]:

```
train.head()
```

Out[45]:

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

In [46]:

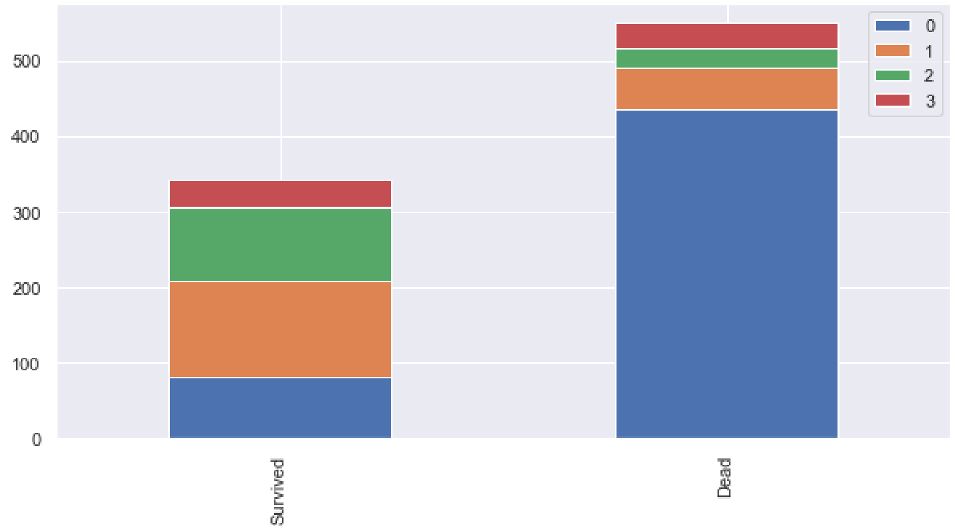
```
test.head()
```

Out[46]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q	0
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S	2
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q	0
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S	0
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S	2

In [47]:

```
bar_chart('Title')
```



In [48]:

```
# delete unnecessary feature from dataset
train.drop('Name', axis=1, inplace=True)
test.drop('Name', axis=1, inplace=True)
```

In [49]:

```
train.head()
```

Out[49]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	male	22.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	female	38.0	1	0	PC 17599	71.2833	C85	C	2
2	3	1	3	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	female	35.0	1	0	113803	53.1000	C123	S	2
4	5	0	3	male	35.0	0	0	373450	8.0500	NaN	S	0

In [50]:

```
test.head()
```

Out[50]:

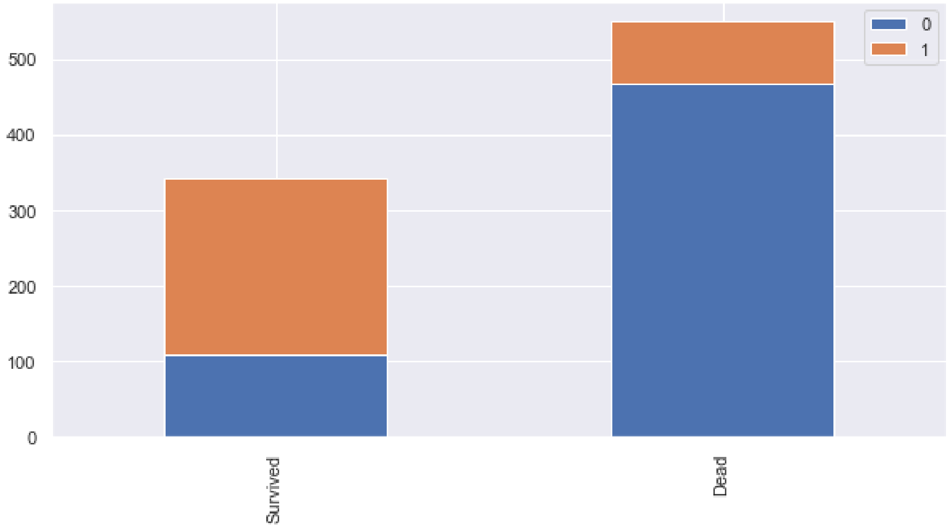
	PassengerId	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	892	3	male	34.5	0	0	330911	7.8292	NaN	Q	0
1	893	3	female	47.0	1	0	363272	7.0000	NaN	S	2
2	894	2	male	62.0	0	0	240276	9.6875	NaN	Q	0
3	895	3	male	27.0	0	0	315154	8.6625	NaN	S	0
4	896	3	female	22.0	1	1	3101298	12.2875	NaN	S	2

In [51]:

```
sex_mapping = {"male": 0, "female": 1}
for dataset in train_test_data:
    dataset['Sex'] = dataset['Sex'].map(sex_mapping)
```

In [52]:

```
bar_chart('Sex')
```



In [53]:

```
train.head()
```

Out[53]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	22.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	1	38.0	1	0	PC 17599	71.2833	C85	C	2
2	3	1	3	1	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	1	35.0	1	0	113803	53.1000	C123	S	2

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
4	5	0	3	0	35.0	0	0	373450	8.0500	NaN	S	0

In [54]:

```
# fill missing age with median age for each title (Mr, Mrs, Miss, Others)
train["Age"].fillna(train.groupby("Title")["Age"].transform("median"), inplace=True)
test["Age"].fillna(test.groupby("Title")["Age"].transform("median"), inplace=True)
```

In [55]:

```
train.groupby("Title")["Age"].transform("median")
train.head()
```

Out[55]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	22.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	1	38.0	1	0	PC 17599	71.2833	C85	C	2
2	3	1	3	1	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	1	35.0	1	0	113803	53.1000	C123	S	2
4	5	0	3	0	35.0	0	0	373450	8.0500	NaN	S	0

In [56]:

```
test.groupby("Title")["Age"].transform("median")
test.head()
```

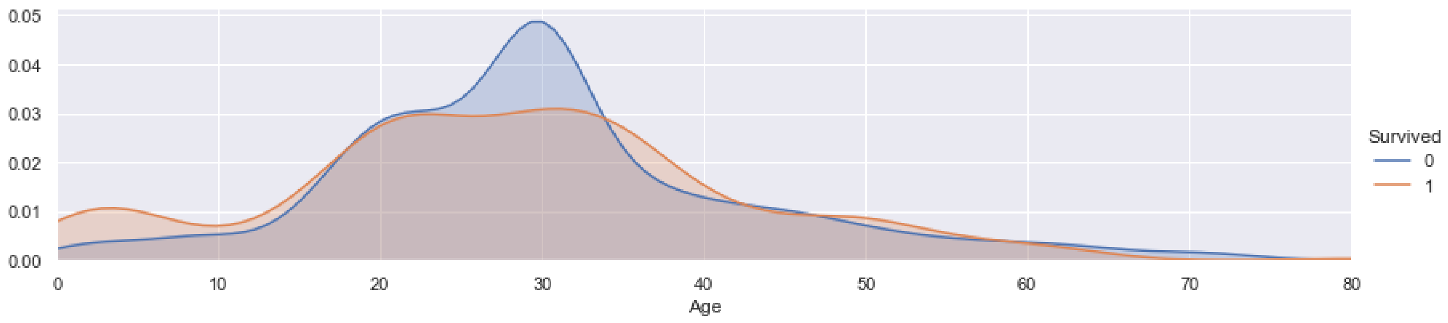
Out[56]:

	PassengerId	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	892	3	0	34.5	0	0	330911	7.8292	NaN	Q	0
1	893	3	1	47.0	1	0	363272	7.0000	NaN	S	2
2	894	2	0	62.0	0	0	240276	9.6875	NaN	Q	0
3	895	3	0	27.0	0	0	315154	8.6625	NaN	S	0
4	896	3	1	22.0	1	1	3101298	12.2875	NaN	S	2

In [57]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Age',shade= True)
facet.set(xlim=(0, train['Age'].max()))
facet.add_legend()

plt.show()
```

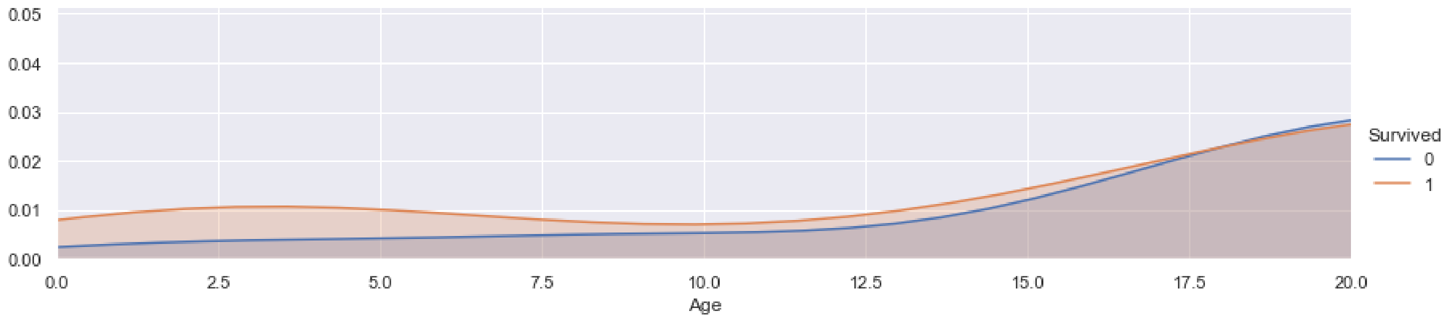


In [58]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Age',shade= True)
facet.set(xlim=(0, train['Age'].max()))
facet.add_legend()
plt.xlim(0, 20)
```

Out[58]:

(0.0, 20.0)

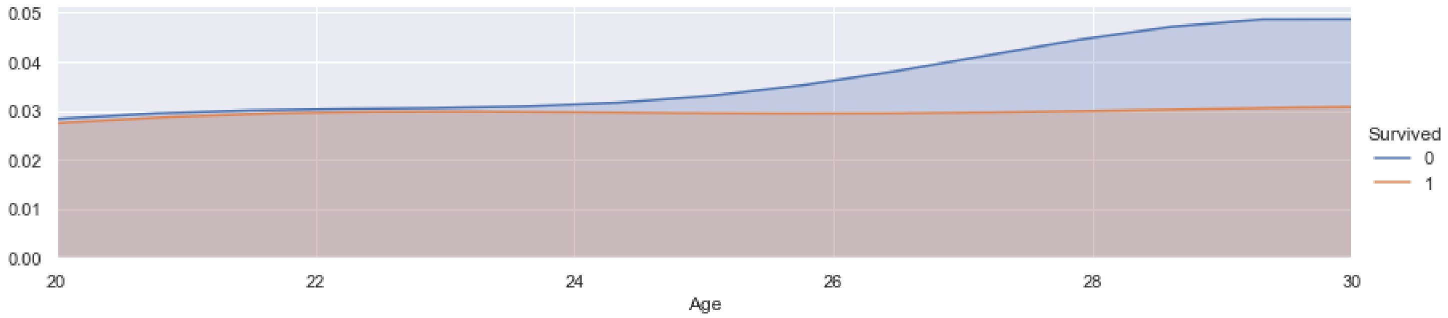


In [59]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Age',shade= True)
facet.set(xlim=(0, train['Age'].max()))
facet.add_legend()
plt.xlim(20, 30)
```

Out[59]:

(20.0, 30.0)

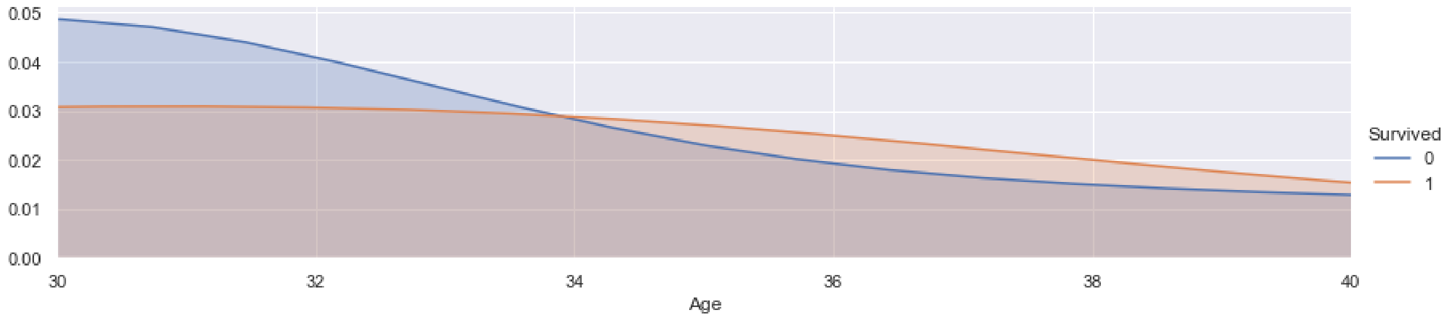


In [60]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Age',shade= True)
facet.set(xlim=(0, train['Age'].max()))
facet.add_legend()
plt.xlim(30, 40)
```

Out[60]:

(30.0, 40.0)

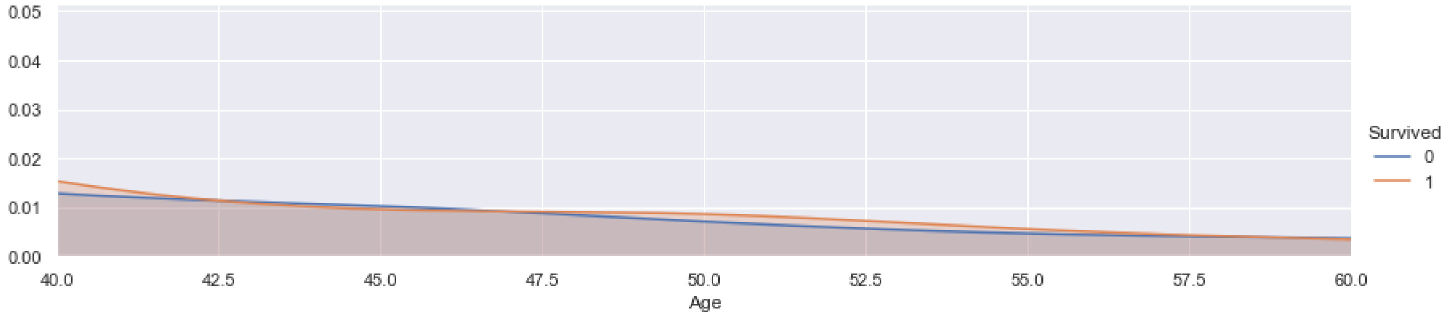


In [61]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Age',shade= True)
facet.set(xlim=(0, train['Age'].max()))
facet.add_legend()
plt.xlim(40, 60)
```

Out[61]:

(40.0, 60.0)



In [62]:

```
train.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   Sex          891 non-null    int64  
 4   Age          891 non-null    float64
 5   SibSp        891 non-null    int64  
 6   Parch        891 non-null    int64  
 7   Ticket       891 non-null    object 
 8   Fare         891 non-null    float64
 9   Cabin        204 non-null    object 
 10  Embarked     889 non-null    object 
 11  Title        891 non-null    int64  
dtypes: float64(2), int64(7), object(3)
memory usage: 83.7+ KB
```

In [63]:

```
test.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   Sex          418 non-null    int64  
 3   Age          418 non-null    float64
 4   SibSp        418 non-null    int64  
 5   Parch        418 non-null    int64  
 6   Ticket       418 non-null    object 
 7   Fare         417 non-null    float64
 8   Cabin        91 non-null     object 
 9   Embarked     418 non-null    object 
 10  Title        418 non-null    int64  
dtypes: float64(2), int64(6), object(3)
memory usage: 36.0+ KB
```

In [64]:

```
for dataset in train_test_data:
    dataset.loc[ dataset['Age'] <= 16, 'Age'] = 0,
    dataset.loc[(dataset['Age'] > 16) & (dataset['Age'] <= 26), 'Age'] = 1,
    dataset.loc[(dataset['Age'] > 26) & (dataset['Age'] <= 36), 'Age'] = 2,
    dataset.loc[(dataset['Age'] > 36) & (dataset['Age'] <= 62), 'Age'] = 3,
    dataset.loc[ dataset['Age'] > 62, 'Age'] = 4
```

In [65]:

```
train.head()
```

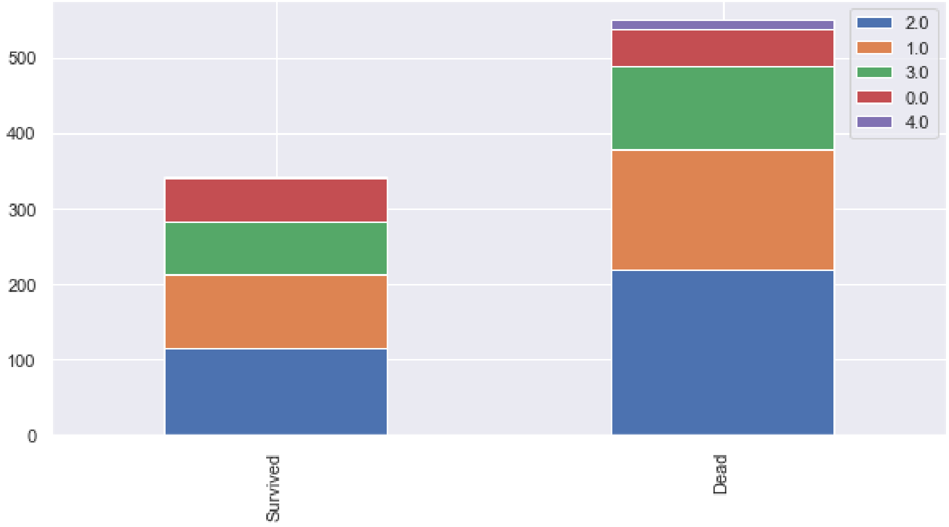
Out[65]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	1	3.0	1	0	PC 17599	71.2833	C85	C	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	1	2.0	1	0	113803	53.1000	C123	S	2
4	5	0	3	0	2.0	0	0	373450	8.0500	NaN	S	0

In [66]:

```
bar_chart('Age')
```

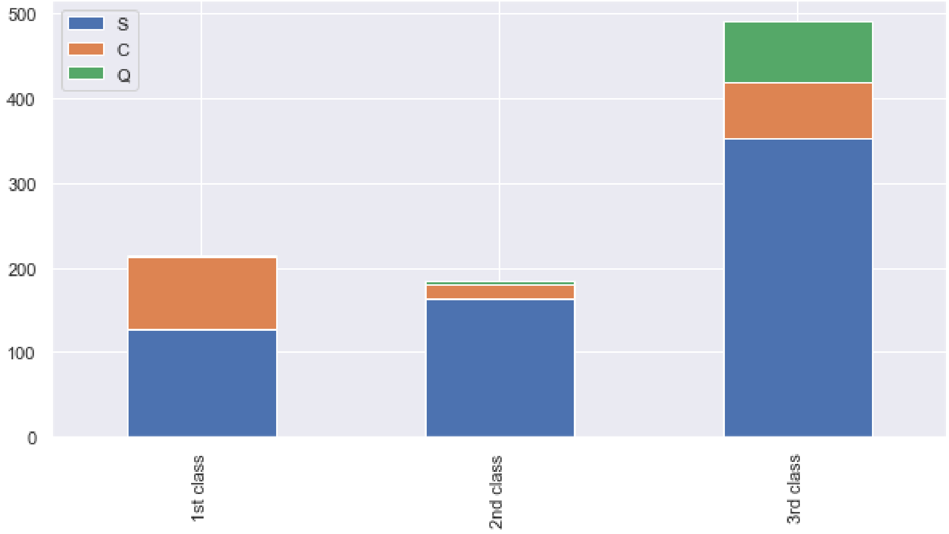


In [67]:

```
Pclass1 = train[train['Pclass']==1]['Embarked'].value_counts()
Pclass2 = train[train['Pclass']==2]['Embarked'].value_counts()
Pclass3 = train[train['Pclass']==3]['Embarked'].value_counts()
df = pd.DataFrame([Pclass1, Pclass2, Pclass3])
df.index = ['1st class','2nd class', '3rd class']
df.plot(kind='bar',stacked=True, figsize=(10,5))
```

Out[67]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x29dbc7cfeb0>
```



In [68]:

```
for dataset in train_test_data:
    dataset['Embarked'] = dataset['Embarked'].fillna('S')
```

In [69]:

```
train.head()
```

Out[69]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	7.2500	NaN	S	0
1	2	1	1	1	3.0	1	0	PC 17599	71.2833	C85	C	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	7.9250	NaN	S	1
3	4	1	1	1	2.0	1	0	113803	53.1000	C123	S	2
4	5	0	3	0	2.0	0	0	373450	8.0500	NaN	S	0

In [70]:

```
embarked_mapping = {"S": 0, "C": 1, "Q": 2}
for dataset in train_test_data:
    dataset['Embarked'] = dataset['Embarked'].map(embarked_mapping)
```

In [71]:

```
train.head()
```

Out[71]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	7.2500	NaN	0	0
1	2	1	1	1	3.0	1	0	PC 17599	71.2833	C85	1	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	7.9250	NaN	0	1
3	4	1	1	1	2.0	1	0	113803	53.1000	C123	0	2
4	5	0	3	0	2.0	0	0	373450	8.0500	NaN	0	0

In [72]:

```
# fill missing Fare with median fare for each Pclass
train["Fare"].fillna(train.groupby("Pclass")["Fare"].transform("median"), inplace=True)
test["Fare"].fillna(test.groupby("Pclass")["Fare"].transform("median"), inplace=True)
train.head(5)
```

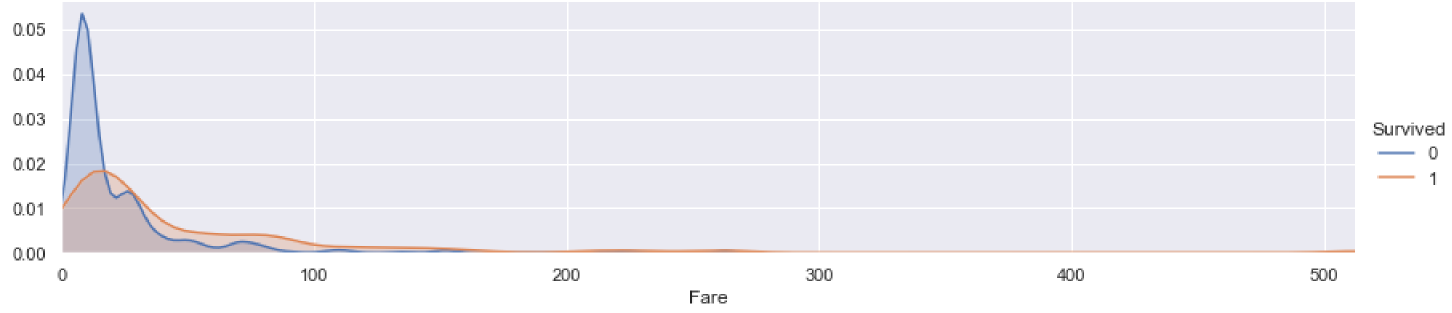
Out[72]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	7.2500	NaN	0	0
1	2	1	1	1	3.0	1	0	PC 17599	71.2833	C85	1	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	7.9250	NaN	0	1
3	4	1	1	1	2.0	1	0	113803	53.1000	C123	0	2
4	5	0	3	0	2.0	0	0	373450	8.0500	NaN	0	0

In [73]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Fare',shade= True)
facet.set(xlim=(0, train['Fare'].max()))
facet.add_legend()

plt.show()
```

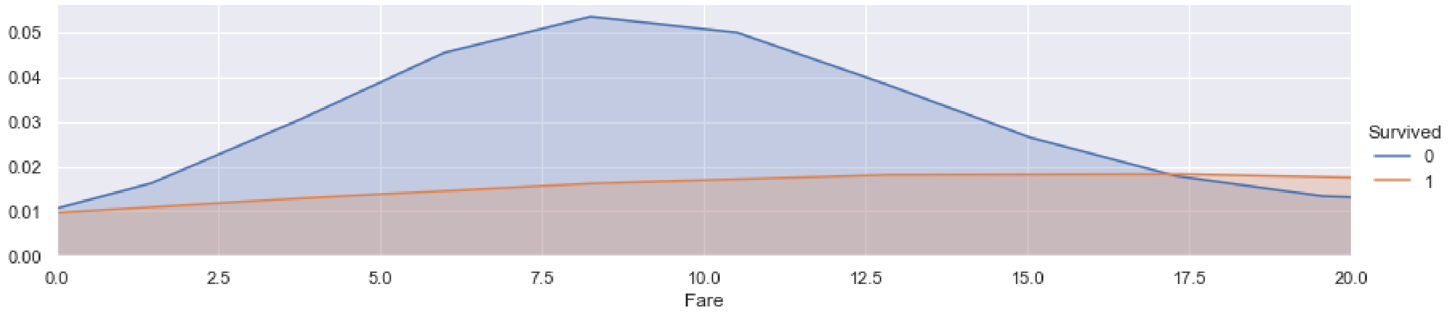


In [74]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Fare',shade= True)
facet.set(xlim=(0, train['Fare'].max()))
facet.add_legend()
plt.xlim(0, 20)
```

Out[74]:

```
(0.0, 20.0)
```

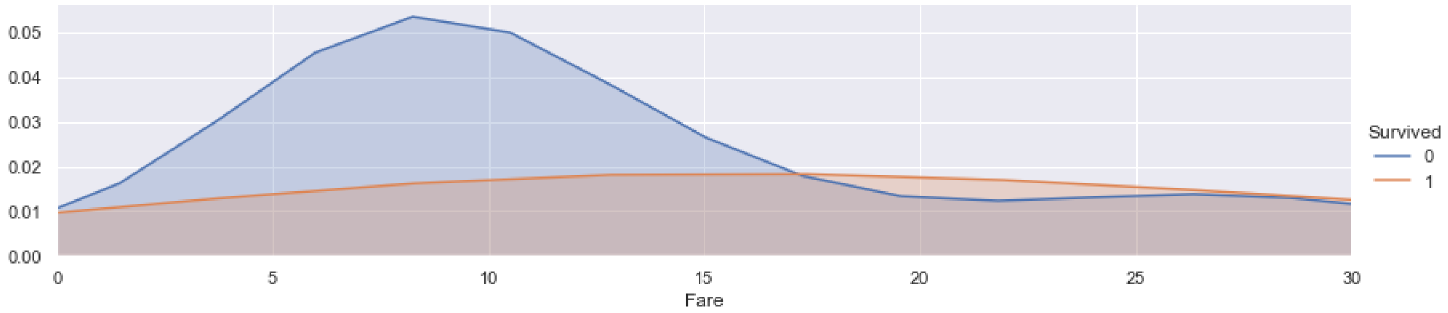


In [75]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'Fare',shade= True)
facet.set(xlim=(0, train['Fare'].max()))
facet.add_legend()
plt.xlim(0, 30)
```

Out[75]:

```
(0.0, 30.0)
```



In [76]:

```
for dataset in train_test_data:
    dataset.loc[ dataset['Fare'] <= 17, 'Fare'] = 0,
    dataset.loc[(dataset['Fare'] > 17) & (dataset['Fare'] <= 30), 'Fare'] = 1,
    dataset.loc[(dataset['Fare'] > 30) & (dataset['Fare'] <= 100), 'Fare'] = 2,
    dataset.loc[ dataset['Fare'] > 100, 'Fare'] = 3
```

In [77]:

```
train.head()
```

Out[77]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	0.0	NaN	0	0
1	2	1	1	1	3.0	1	0	PC 17599	2.0	C85	1	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	0.0	NaN	0	1
3	4	1	1	1	2.0	1	0	113803	2.0	C123	0	2
4	5	0	3	0	2.0	0	0	373450	0.0	NaN	0	0

In [78]:

In [78]:

```
train.Cabin.value_counts()
```

Out[78]:

```
C23 C25 C27    4
G6             4
B96 B98        4
C22 C26        3
F33            3
              ..
B86            1
E77            1
C47            1
C86            1
A19            1
Name: Cabin, Length: 147, dtype: int64
```

In [79]:

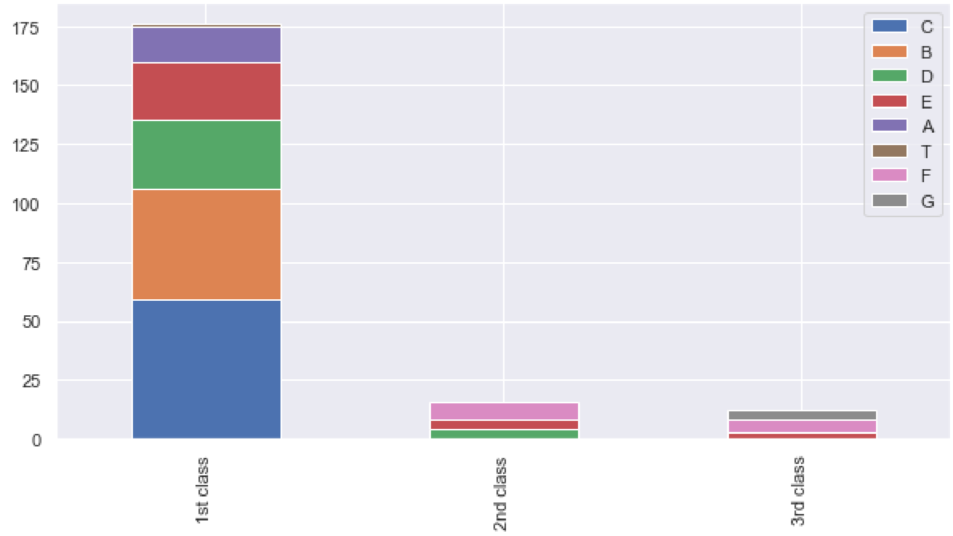
```
for dataset in train_test_data:
    dataset['Cabin'] = dataset['Cabin'].str[:1]
```

In [80]:

```
Pclass1 = train[train['Pclass']==1]['Cabin'].value_counts()
Pclass2 = train[train['Pclass']==2]['Cabin'].value_counts()
Pclass3 = train[train['Pclass']==3]['Cabin'].value_counts()
df = pd.DataFrame([Pclass1, Pclass2, Pclass3])
df.index = ['1st class','2nd class', '3rd class']
df.plot(kind='bar',stacked=True, figsize=(10,5))
```

Out[80]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x29dbc9e2a60>
```



In [81]:

```
cabin_mapping = {"A": 0, "B": 0.4, "C": 0.8, "D": 1.2, "E": 1.6, "F": 2, "G": 2.4, "T": 2.8}
for dataset in train_test_data:
    dataset['Cabin'] = dataset['Cabin'].map(cabin_mapping)
```

In [85]:

```
#fill missing Fare with median fare for each Pclass
train["Cabin"].fillna(train.groupby("Pclass")["Cabin"].transform("median"), inplace=True)
test["Cabin"].fillna(test.groupby("Pclass")["Cabin"].transform("median"), inplace=True)
```

In [86]:

```
train.head()
```

Out[86]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	1	0	3	0	1.0	1	0	A/5 21171	0.0	2.0	0	0
1	2	1	1	1	3.0	1	0	PC 17599	2.0	0.8	1	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	0.0	2.0	0	1
3	4	1	1	1	2.0	1	0	113803	2.0	0.8	0	2
4	5	0	3	0	2.0	0	0	373450	0.0	2.0	0	0

In [87]:

```
test.head()
```

Out[87]:

	PassengerId	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title
0	892	3	0	2.0	0	0	330911	0.0	2.0	2	0
1	893	3	1	3.0	1	0	363272	0.0	2.0	0	2
2	894	2	0	3.0	0	0	240276	0.0	2.0	2	0
3	895	3	0	2.0	0	0	315154	0.0	2.0	0	0
4	896	3	1	1.0	1	1	3101298	0.0	2.0	0	2

In [89]:

```
train["FamilySize"] = train["SibSp"] + train["Parch"] + 1
test["FamilySize"] = test["SibSp"] + test["Parch"] + 1
```

In [90]:

```
train.head()
```

Out[90]:

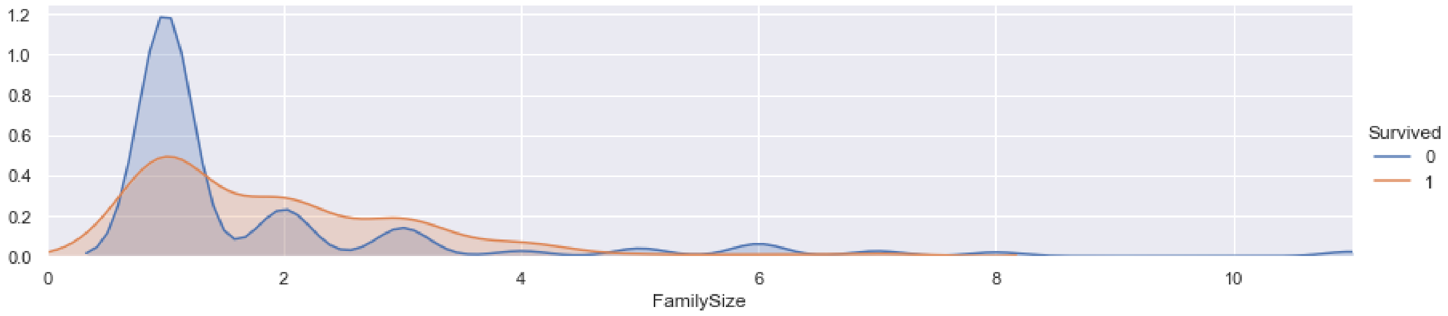
	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title	FamilySize
0	1	0	3	0	1.0	1	0	A/5 21171	0.0	2.0	0	0	2
1	2	1	1	1	3.0	1	0	PC 17599	2.0	0.8	1	2	2
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	0.0	2.0	0	1	1
3	4	1	1	1	2.0	1	0	113803	2.0	0.8	0	2	2
4	5	0	3	0	2.0	0	0	373450	0.0	2.0	0	0	1

In [91]:

```
facet = sns.FacetGrid(train, hue="Survived",aspect=4)
facet.map(sns.kdeplot,'FamilySize',shade= True)
facet.set(xlim=(0, train['FamilySize'].max()))
facet.add_legend()
plt.xlim(0)
```

Out[91]:

```
(0.0, 11.0)
```



In [92]:

```
family_mapping = {1: 0, 2: 0.4, 3: 0.8, 4: 1.2, 5: 1.6, 6: 2, 7: 2.4, 8: 2.8, 9: 3.2, 10: 3.6, 11: 4}
```

```
for dataset in train_test_data:
    dataset['FamilySize'] = dataset['FamilySize'].map(family_mapping)
```

In [93]:

```
train.head()
```

Out[93]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title	FamilySize
0	1	0	3	0	1.0	1	0	A/5 21171	0.0	2.0	0	0	0.4
1	2	1	1	1	3.0	1	0	PC 17599	2.0	0.8	1	2	0.4
2	3	1	3	1	1.0	0	0	STON/O2. 3101282	0.0	2.0	0	1	0.0
3	4	1	1	1	2.0	1	0	113803	2.0	0.8	0	2	0.4
4	5	0	3	0	2.0	0	0	373450	0.0	2.0	0	0	0.0

In [94]:

```
test.head()
```

Out[94]:

	PassengerId	Pclass	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Title	FamilySize
0	892	3	0	2.0	0	0	330911	0.0	2.0	2	0	0.0
1	893	3	1	3.0	1	0	363272	0.0	2.0	0	2	0.4
2	894	2	0	3.0	0	0	240276	0.0	2.0	2	0	0.0
3	895	3	0	2.0	0	0	315154	0.0	2.0	0	0	0.0
4	896	3	1	1.0	1	1	3101298	0.0	2.0	0	2	0.8

In [95]:

```
features_drop = ['Ticket', 'SibSp', 'Parch']
train = train.drop(features_drop, axis=1)
test = test.drop(features_drop, axis=1)
train = train.drop(['PassengerId'], axis=1)
```

In [96]:

```
train_data = train.drop('Survived', axis=1)
target = train['Survived']

train_data.shape, target.shape
```

Out[96]:

```
((891, 8), (891,))
```

In [97]:

```
train_data.head()
```

Out[97]:

	Pclass	Sex	Age	Fare	Cabin	Embarked	Title	FamilySize
0	3	0	1.0	0.0	2.0	0	0	0.4
1	1	1	3.0	2.0	0.8	1	2	0.4
2	3	1	1.0	0.0	2.0	0	1	0.0
3	1	1	2.0	2.0	0.8	0	2	0.4
4	3	0	2.0	0.0	2.0	0	0	0.0

In [98]:

```
# Importing Classifier Modules
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier

import numpy as np
```

In [99]:

```
train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 9 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Survived    891 non-null    int64  
 1   Pclass      891 non-null    int64  
 2   Sex         891 non-null    int64  
 3   Age         891 non-null    float64
 4   Fare        891 non-null    float64
 5   Cabin       891 non-null    float64
 6   Embarked    891 non-null    int64  
 7   Title       891 non-null    int64  
 8   FamilySize  891 non-null    float64
dtypes: float64(4), int64(5)
memory usage: 62.8 KB
```

In [100]:

```
from sklearn.model_selection import KFold
from sklearn.model_selection import cross_val_score
k_fold = KFold(n_splits=10, shuffle=True, random_state=0)
```

In [101]:

```
clf = DecisionTreeClassifier()
scoring = 'accuracy'
score = cross_val_score(clf, train_data, target, cv=k_fold, n_jobs=1, scoring=scoring)
print(score)
```

```
[0.76666667 0.83146067 0.7752809  0.76404494 0.88764045 0.76404494
 0.83146067 0.82022472 0.74157303 0.78651685]
```

In [102]:

```
# decision tree Score
round(np.mean(score)*100, 2)
```

Out[102]:

```
79.69
```

In [103]:

```
clf = RandomForestClassifier(n_estimators=13)
scoring = 'accuracy'
score = cross_val_score(clf, train_data, target, cv=k_fold, n_jobs=1, scoring=scoring)
print(score)
```

```
[0.77777778 0.83146067 0.82022472 0.80898876 0.93258427 0.80898876
 0.82022472 0.82022472 0.78651685 0.80898876]
```

In [104]:

```
# Random Forest Score
round(np.mean(score)*100, 2)
```

Out[104]:

```
82.16
```

In [105]:

```
clf = RandomForestClassifier(n_estimators=13)
clf.fit(train_data, target)
```

```
test_data = test.drop("PassengerId", axis=1).copy()
prediction = clf.predict(test_data)
```

In [106]:

```
submission = pd.DataFrame({
        "PassengerId": test["PassengerId"],
        "Survived": prediction
    })

submission.to_csv('submission.csv', index=False)
```

In [107]:

```
submission = pd.read_csv('submission.csv')
submission.head()
```

Out[107]:

	PassengerId	Survived
0	892	0
1	893	0
2	894	0
3	895	0
4	896	1

In [ ]: