In [95]:
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn import metrics
import seaborn as sns
import matplotlib.pyplot as plt
```

In [97]:
```
df = pd.read_csv(r"C:\TE sem 7\data modeling and visualization\Telcom_Customer
df
```

Out[97]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneS
0	7590-VHVEG	Female	0	Yes	No	1	
1	5575-GNVDE	Male	0	No	No	34	
2	3668-QPYBK	Male	0	No	No	2	
3	7795-CFOCW	Male	0	No	No	45	
4	9237-HQITU	Female	0	No	No	2	
...	...	...	...	...	...	...	
7038	6840-RESVB	Male	0	Yes	Yes	24	
7039	2234-XADUH	Female	0	Yes	Yes	72	
7040	4801-JZAZL	Female	0	Yes	Yes	11	
7041	8361-LTMKD	Male	1	Yes	No	4	
7042	3186-AJIEK	Male	0	No	No	66	

7043 rows × 21 columns

In [99]:
```
df.describe()
```

Out[99]:

	SeniorCitizen	tenure	MonthlyCharges
count	7043.000000	7043.000000	7043.000000
mean	0.162147	32.371149	64.761692
std	0.368612	24.559481	30.090047
min	0.000000	0.000000	18.250000
25%	0.000000	9.000000	35.500000
50%	0.000000	29.000000	70.350000
75%	0.000000	55.000000	89.850000
max	1.000000	72.000000	118.750000

In [101…

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   customerID        7043 non-null   object 
 1   gender            7043 non-null   object 
 2   SeniorCitizen     7043 non-null   int64  
 3   Partner           7043 non-null   object 
 4   Dependents        7043 non-null   object 
 5   tenure            7043 non-null   int64  
 6   PhoneService      7043 non-null   object 
 7   MultipleLines     7043 non-null   object 
 8   InternetService   7043 non-null   object 
 9   OnlineSecurity    7043 non-null   object 
 10  OnlineBackup      7043 non-null   object 
 11  DeviceProtection  7043 non-null   object 
 12  TechSupport       7043 non-null   object 
 13  StreamingTV       7043 non-null   object 
 14  StreamingMovies   7043 non-null   object 
 15  Contract          7043 non-null   object 
 16  PaperlessBilling  7043 non-null   object 
 17  PaymentMethod     7043 non-null   object 
 18  MonthlyCharges    7043 non-null   float64
 19  TotalCharges      7043 non-null   object 
 20  Churn             7043 non-null   object 
dtypes: float64(1), int64(2), object(18)
memory usage: 1.1+ MB
```

In [103…

```
df.columns
```

Out[103…
```
Index(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection', 'TechSupport',
       'StreamingTV', 'StreamingMovies', 'Contract', 'PaperlessBilling',
       'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn'],
      dtype='object')
```

In [105…
```
df.isnull().sum()
```

Out[105…
```
customerID          0
gender              0
SeniorCitizen       0
Partner             0
Dependents          0
tenure              0
PhoneService        0
MultipleLines       0
InternetService     0
OnlineSecurity      0
OnlineBackup        0
DeviceProtection    0
TechSupport         0
StreamingTV         0
StreamingMovies     0
Contract            0
PaperlessBilling    0
PaymentMethod       0
MonthlyCharges      0
TotalCharges        0
Churn               0
dtype: int64
```

In [107…
```
df.nunique()
```

Out[107…
```
customerID          7043
gender                 2
SeniorCitizen          2
Partner                2
Dependents             2
tenure                73
PhoneService           2
MultipleLines          3
InternetService        3
OnlineSecurity         3
OnlineBackup           3
DeviceProtection       3
TechSupport            3
StreamingTV            3
StreamingMovies        3
Contract               3
PaperlessBilling       2
PaymentMethod          4
MonthlyCharges      1585
TotalCharges        6531
Churn                  2
dtype: int64
```

In [109…
```
data = df.drop_duplicates()
```

In [111…
```
# Measure of frequency destribution
unique, counts = np.unique(data['tenure'], return_counts=True)
print(unique, counts)
```

```
[ 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
 72] [ 11 613 238 200 176 133 110 131 123 119 116  99 117 109  76  99  80  87
  97  73  71  63  90  85  94  79  79  72  57  72  72  65  69  64  65  88
  50  65  59  56  64  70  65  65  51  61  74  68  64  66  68  68  80  70
  68  64  80  65  67  60  76  76  70  72  80  76  89  98 100  95 119 170
 362]
```

In [113…
```
# Measure of frequency destribution
unique, counts = np.unique(data['MonthlyCharges'], return_counts=True)
print(unique, counts)
```

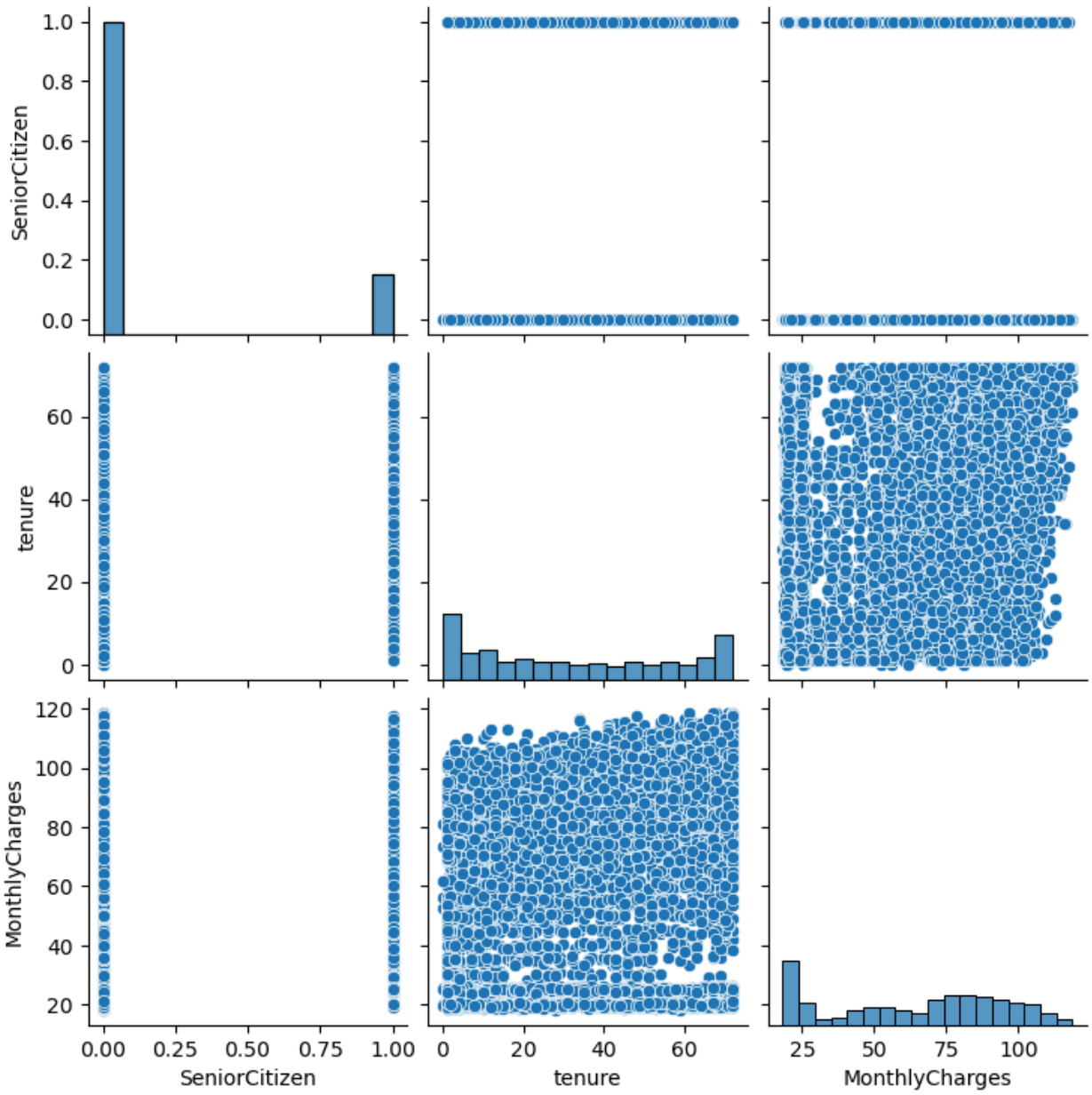
```
[ 18.25  18.4   18.55 ... 118.6  118.65 118.75] [1 1 1 ... 2 1 1]
```

In [115…
```
# Measure of frequency destribution
unique, counts = np.unique(data['TotalCharges'], return_counts=True)
print(unique, counts)
```

```
[' ' '100.2' '100.25' ... '999.45' '999.8' '999.9'] [11  1  1 ...  1  1  1]
```

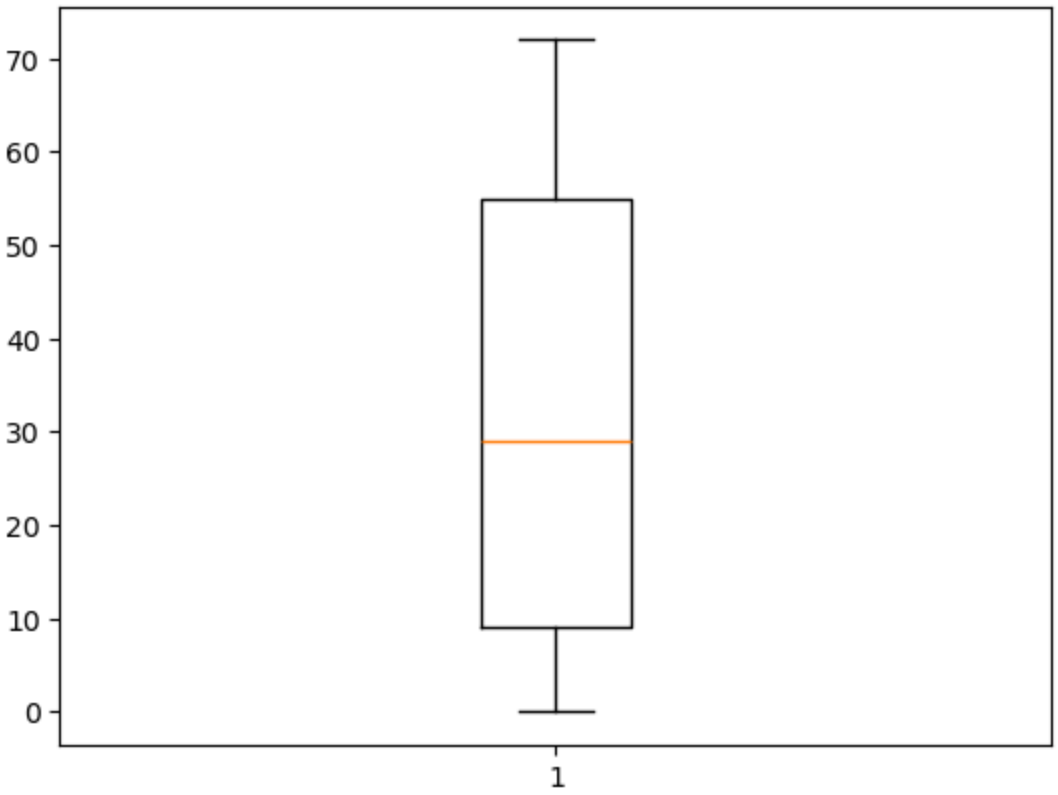
In [119…
```
sns.pairplot(data)
```

Out[119…
```
<seaborn.axisgrid.PairGrid at 0x22ad333bb60>
```



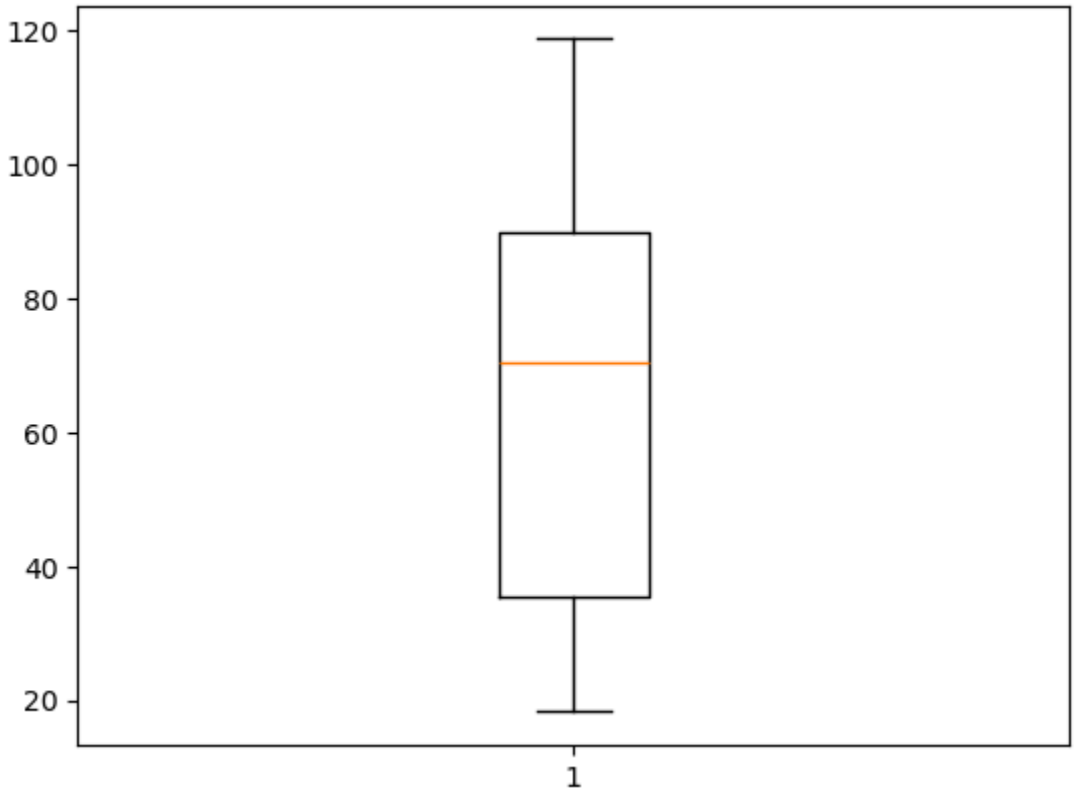
In [121…

```
plt.boxplot(data['tenure'])
plt.show()
```



In [123…

```
plt.boxplot(data['MonthlyCharges'])
plt.show()
```



In [127…
```
X = data.drop("Churn", axis=1)
y = data["Churn"]
# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, randc
X_train.shape
y_train.shape
```

Out[127…
```
(5634,)
```

In [131…
```
# Export the cleaned dataset to a CSV file
data.to_csv("C:\TE sem 7\Cleaned_Telecom_Customer_Churn.csv", index=False)
```

```
<>:2: SyntaxWarning: invalid escape sequence '\T'
<>:2: SyntaxWarning: invalid escape sequence '\T'
C:\Users\vidhi\AppData\Local\Temp\ipykernel_14808\1954550207.py:2: SyntaxWarnin
g: invalid escape sequence '\T'
  data.to_csv("C:\TE sem 7\Cleaned_Telecom_Customer_Churn.csv", index=False)
```

In [ ]: