In [2]:
```
#Implement Random Forest Classifier model to predict the safety of the car.
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.preprocessing import LabelEncoder
```

In [3]:
```
car = pd.read_csv("car_evaluation.csv")
car.head()
```

Out[3]:

	vhigh	vhigh.1	2	2.1	small	low	unacc
0	vhigh	vhigh	2	2	small	med	unacc
1	vhigh	vhigh	2	2	small	high	unacc
2	vhigh	vhigh	2	2	med	low	unacc
3	vhigh	vhigh	2	2	med	med	unacc
4	vhigh	vhigh	2	2	med	high	unacc

In [4]:
```
print("Number of rows: ", car.shape[0], "\nNumber of columns: ", car.shape[1])
```

```
Number of rows:  1727
Number of columns:  7
```

In [9]:
```
print("Name of columns: ", car.columns)
```

```
Name of columns:  Index(['vhigh', 'vhigh.1', '2', '2.1', 'small', 'low', 'unacc'], d
type='object')
```

In [5]:
```
car.isnull().sum()
```

Out[5]:
```
vhigh      0
vhigh.1    0
2          0
2.1        0
small      0
low        0
unacc      0
dtype: int64
```

In [6]:
```
car.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1727 entries, 0 to 1726
Data columns (total 7 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   vhigh    1727 non-null   object
 1   vhigh.1  1727 non-null   object
 2   2        1727 non-null   object
 3   2.1      1727 non-null   object
 4   small    1727 non-null   object
 5   low      1727 non-null   object
 6   unacc    1727 non-null   object
dtypes: object(7)
memory usage: 94.6+ KB
```

In [7]:
```
car.describe()
```

Out[7]:

	vhigh	vhigh.1	2	2.1	small	low	unacc
count	1727	1727	1727	1727	1727	1727	1727
unique	4	4	4	3	3	3	4
top	high	high	3	4	med	med	unacc
freq	432	432	432	576	576	576	1209

In [10]:
```
#Encode Categorical Variables
le = LabelEncoder()
for col in car.columns:
    car[col] = le.fit_transform(car[col])
```

In [11]:
```
# Split Features and Target
X = car.drop('unacc', axis=1)  # Features
y = car['unacc']
```

In [12]:
```
# Split into training and testing sets (80% train, 20% test)
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)
```

In [13]:
```
# Train Random Forest Classifier
rf_model = RandomForestClassifier(n_estimators=100, random_state=42)
rf_model.fit(X_train, y_train)
```

Out[13]:

▾ RandomForestClassifier

```
RandomForestClassifier(random_state=42)
```

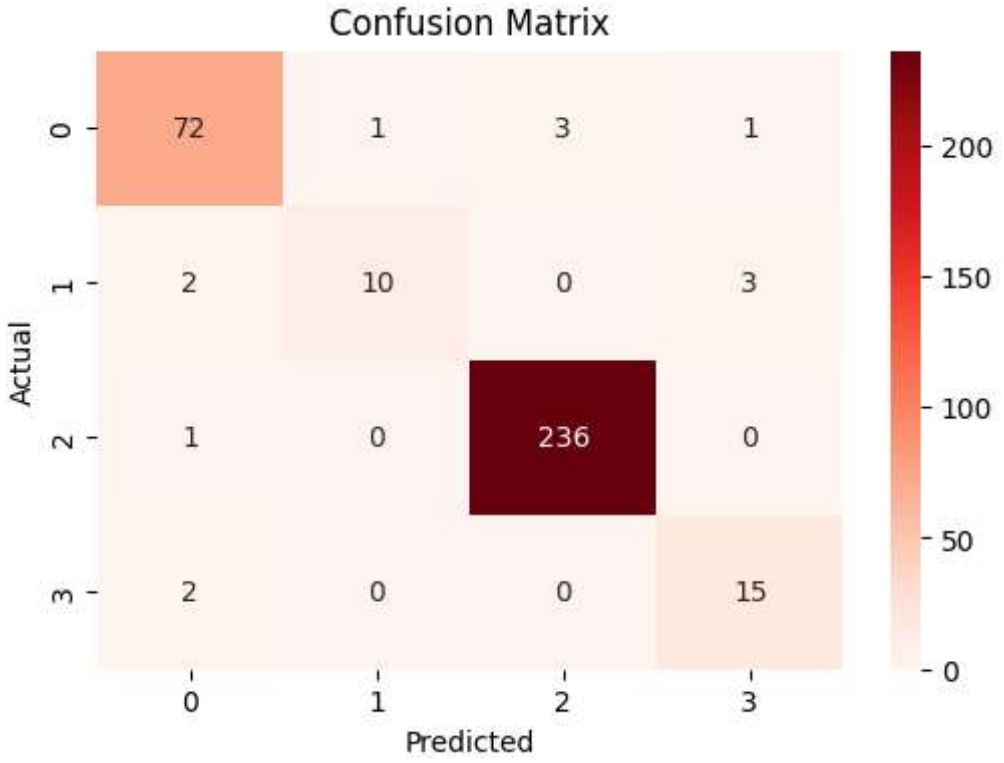
In [14]:
```
#  Predictions
y_pred = rf_model.predict(X_test)
```

In [15]:
```
# Evaluate the Model
print("Accuracy:", accuracy_score(y_test, y_pred))
print("\nConfusion Matrix:")
cm = confusion_matrix(y_test, y_pred)
print(cm)
```

```
Accuracy: 0.9624277456647399

Confusion Matrix:
[[ 72   1   3   1]
 [  2  10   0   3]
 [  1   0 236   0]
 [  2   0   0  15]]
```

In [19]:
```
# Visualize confusion matrix
plt.figure(figsize=(6,4))
sns.heatmap(cm, annot=True, fmt='d', cmap='Reds')
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix")
plt.show()
```



In [17]:
```
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```

```
Classification Report:
              precision    recall  f1-score   support

           0       0.94      0.94      0.94        77
           1       0.91      0.67      0.77        15
           2       0.99      1.00      0.99       237
           3       0.79      0.88      0.83        17

    accuracy                           0.96       346
   macro avg       0.91      0.87      0.88       346
weighted avg       0.96      0.96      0.96       346
```

In [18]:
```
# Feature Importance
importances = rf_model.feature_importances_
feature_names = X.columns
plt.figure(figsize=(8,5))
sns.barplot(x=feature_names, y=importances)
plt.title("Feature Importance")
plt.show()
```