Title:-Exploratory-Data-Analysis-on-Indian-Flight-Prices.

Extraction of Zip file.

In [8]:

```
import zipfile
import os

# File path
zip_path = 'Flight_Ticket_Participant_Datasets.zip'
extract_folder = 'Flight_Ticket_Participant_Datasets'

# Create folder and extract ZIP
os.makedirs(extract_folder, exist_ok=True)
with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    zip_ref.extractall(extract_folder)

print("✅ ZIP Extraction Completed!")
```

```
✅ ZIP Extraction Completed!
```

Data Loading.

In [9]:

```
import pandas as pd
import glob

# Find all CSV files in extracted folder
csv_files = glob.glob(extract_folder + "/*.csv")

# Read and combine into single DataFrame
df_list = [pd.read_csv(file) for file in csv_files]
df = pd.concat(df_list, ignore_index=True)

print(f"✅ Data Loaded! Combined shape: {df.shape}")
df.head()
```

```
✅ Data Loaded! Combined shape: (404, 8)
```

Out[9]:

	FlightName	FlightCode	DepartingCity	DepartingTime	ArrivingCity	ArrivingTime
0	Air India	AI 621	Mumbai	03:55	Bengaluru	05:50
1	AirAsia	I5 670	Mumbai	19:55	Bengaluru	21:45
2	AirAsia	I5 2992	Mumbai	23:55	Bengaluru	01:45\r\n+ 1 DAY
3	IndiGo	6E 5388	Mumbai	21:30	Bengaluru	23:15
4	Akasa Air	QP 1103	Mumbai	00:45	Bengaluru	02:20

Data Preprocessing.

In [14]:

```
# Check for null values
print("\nNull values per column:")
print(df.isnull().sum())

# Remove commas from Price column safely (if any)
df['Price'] = df['Price'].apply(lambda x: int(str(x).replace(',', '')))

# Strip whitespace from text fields
df['FlightName'] = df['FlightName'].astype(str).str.strip()
df['DepartingCity'] = df['DepartingCity'].astype(str).str.strip()
df['ArrivingCity'] = df['ArrivingCity'].astype(str).str.strip()

print("✅ Data Preprocessing Done")
df.head()
```

```
Null values per column:
FlightName       0
FlightCode       0
DepartingCity    0
DepartingTime    0
ArrivingCity     0
ArrivingTime     0
Duration         0
Price            0
dtype: int64
✅ Data Preprocessing Done
```

Out[14]:

	FlightName	FlightCode	DepartingCity	DepartingTime	ArrivingCity	ArrivingTime
0	Air India	AI 621	Mumbai	03:55	Bengaluru	05:50
1	AirAsia	I5 670	Mumbai	19:55	Bengaluru	21:45
2	AirAsia	I5 2992	Mumbai	23:55	Bengaluru	01:45\r\n+ 1 DAY
3	IndiGo	6E 5388	Mumbai	21:30	Bengaluru	23:15
4	Akasa Air	QP 1103	Mumbai	00:45	Bengaluru	02:20

Feature Engineering.

In [18]:

```
# Create 'Route' column
df['Route'] = df['DepartingCity'] + " → " + df['ArrivingCity']

# Convert 'DepartingTime' to datetime to extract hour
df['DepartureHour'] = pd.to_datetime(df['DepartingTime']).dt.hour

print("✅ Feature Engineering Done")
df.head()
```

```
✅ Feature Engineering Done
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\349626817.py:5: UserWarnin
g: Could not infer format, so each element will be parsed individually, falling b
ack to `dateutil`. To ensure parsing is consistent and as-expected, please specif
y a format.
  df['DepartureHour'] = pd.to_datetime(df['DepartingTime']).dt.hour
```

Out[18]:

	FlightName	FlightCode	DepartingCity	DepartingTime	ArrivingCity	ArrivingTime
0	Air India	AI 621	Mumbai	03:55	Bengaluru	05:50
1	AirAsia	I5 670	Mumbai	19:55	Bengaluru	21:45
2	AirAsia	I5 2992	Mumbai	23:55	Bengaluru	01:45\r\n+ 1 DAY
3	IndiGo	6E 5388	Mumbai	21:30	Bengaluru	23:15
4	Akasa Air	QP 1103	Mumbai	00:45	Bengaluru	02:20

Data Summary.

In [19]:

```
# Get unique airlines
print("\nUnique Flight Names:", df['FlightName'].nunique())

# Top airlines by frequency
print("\nTop Airlines:\n", df['FlightName'].value_counts())

# Price range
print(f"\nPrice Range: ₹{df['Price'].min()} to ₹{df['Price'].max()}")
```

```
Unique Flight Names: 6

Top Airlines:
 FlightName
IndiGo       188
Vistara       80
Air India     77
Akasa Air     30
SpiceJet      19
AirAsia       10
Name: count, dtype: int64

Price Range: ₹2307 to ₹20581
```

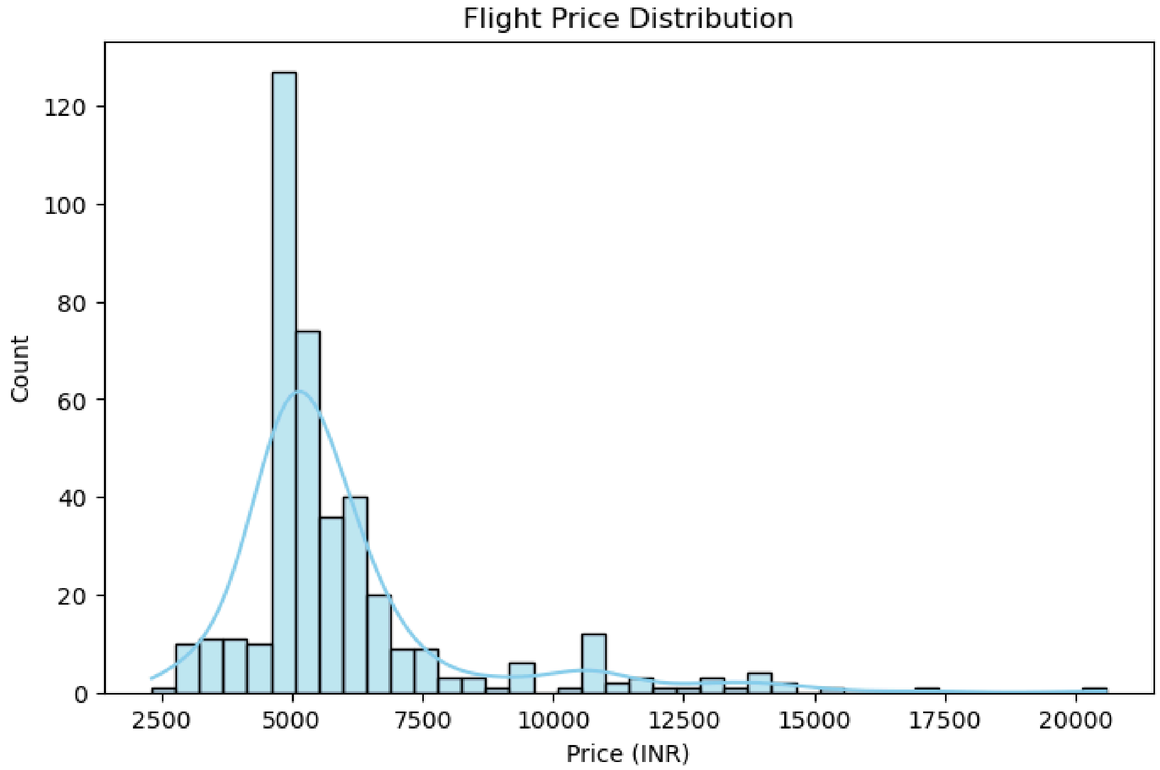
Data Visualization

Price Distribution

In [20]:

```
import seaborn as sns
import matplotlib.pyplot as plt
```

```
plt.figure(figsize=(8,5))
sns.histplot(df['Price'], bins=40, kde=True, color='skyblue')
plt.title("Flight Price Distribution")
plt.xlabel("Price (INR)")
plt.ylabel("Count")
plt.show()
```



Average Price by Departing City

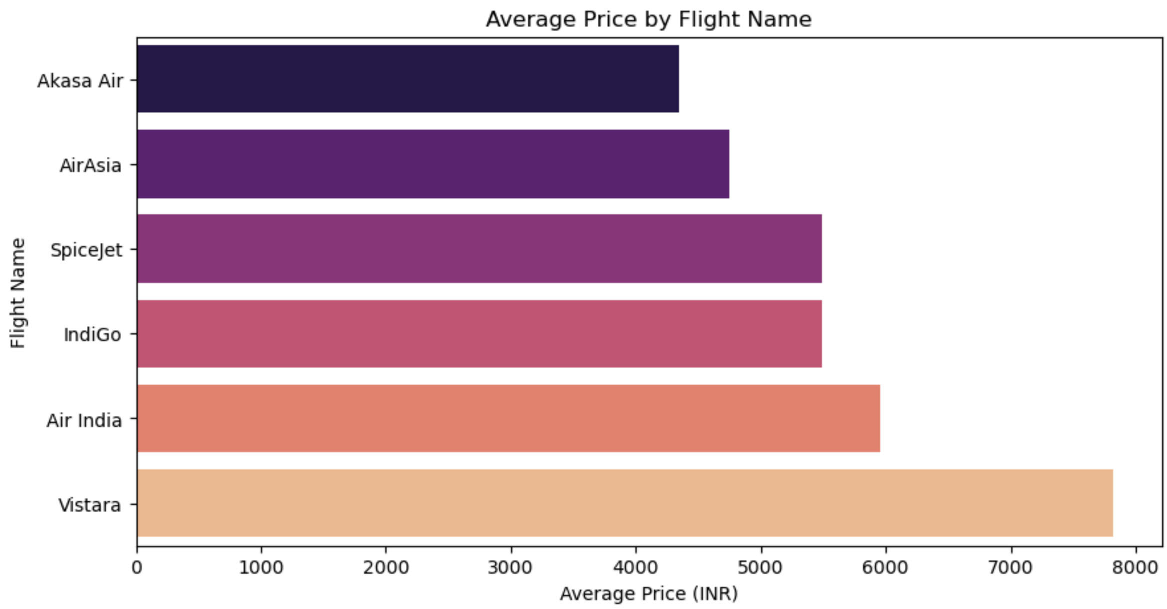
In [21]:
```
plt.figure(figsize=(10,5))
avg_depart_city = df.groupby('DepartingCity')['Price'].mean().sort_values()
sns.barplot(x=avg_depart_city.values, y=avg_depart_city.index, palette='viridis'
plt.title("Average Price by Departing City")
plt.xlabel("Average Price (INR)")
plt.ylabel("Departing City")
plt.show()
```

```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\2703012239.py:3: FutureWar
ning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.barplot(x=avg_depart_city.values, y=avg_depart_city.index, palette='viridi
s')
```

Average Price by Flight Name (Airline)

In [22]:
```
plt.figure(figsize=(10,5))
avg_airline = df.groupby('FlightName')['Price'].mean().sort_values()
sns.barplot(x=avg_airline.values, y=avg_airline.index, palette='magma')
plt.title("Average Price by Flight Name")
plt.xlabel("Average Price (INR)")
plt.ylabel("Flight Name")
plt.show()
```

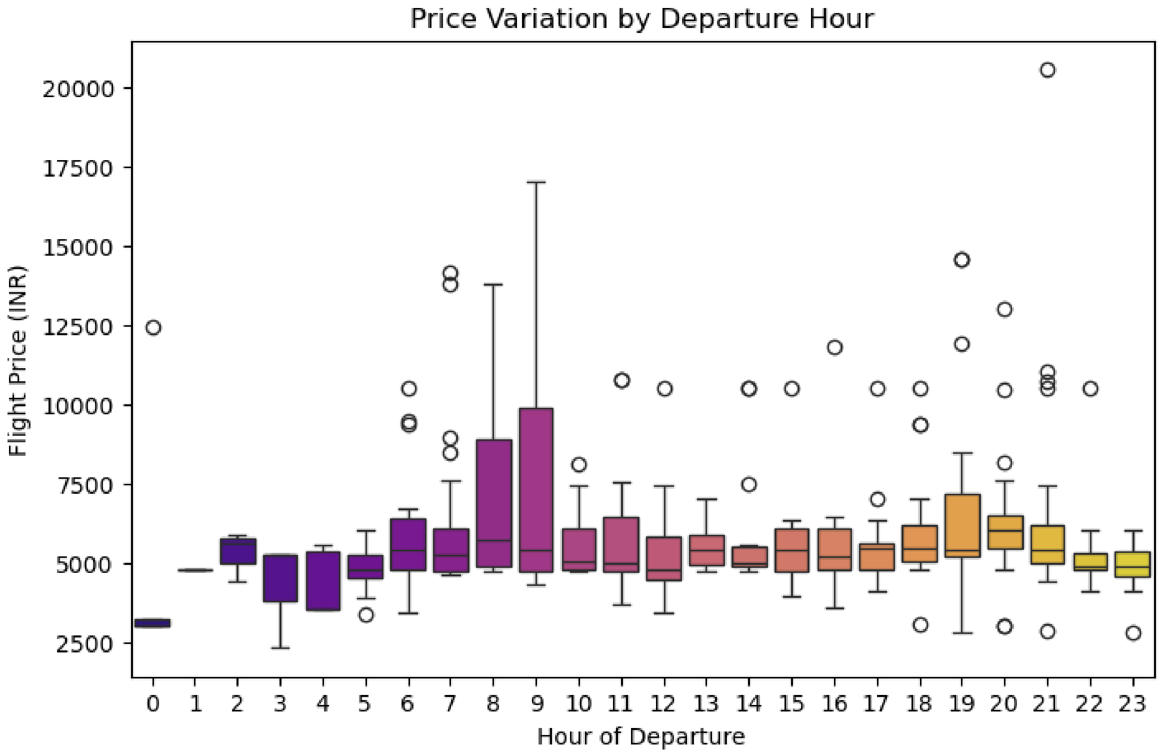
```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\2681216239.py:3: FutureWar
ning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.barplot(x=avg_airline.values, y=avg_airline.index, palette='magma')
```



Departure Hour vs Price

In [24]:
```
plt.figure(figsize=(8,5))
sns.boxplot(x='DepartureHour', y='Price', data=df, palette='plasma')
plt.title("Price Variation by Departure Hour")
plt.xlabel("Hour of Departure")
plt.ylabel("Flight Price (INR)")
plt.show()
```

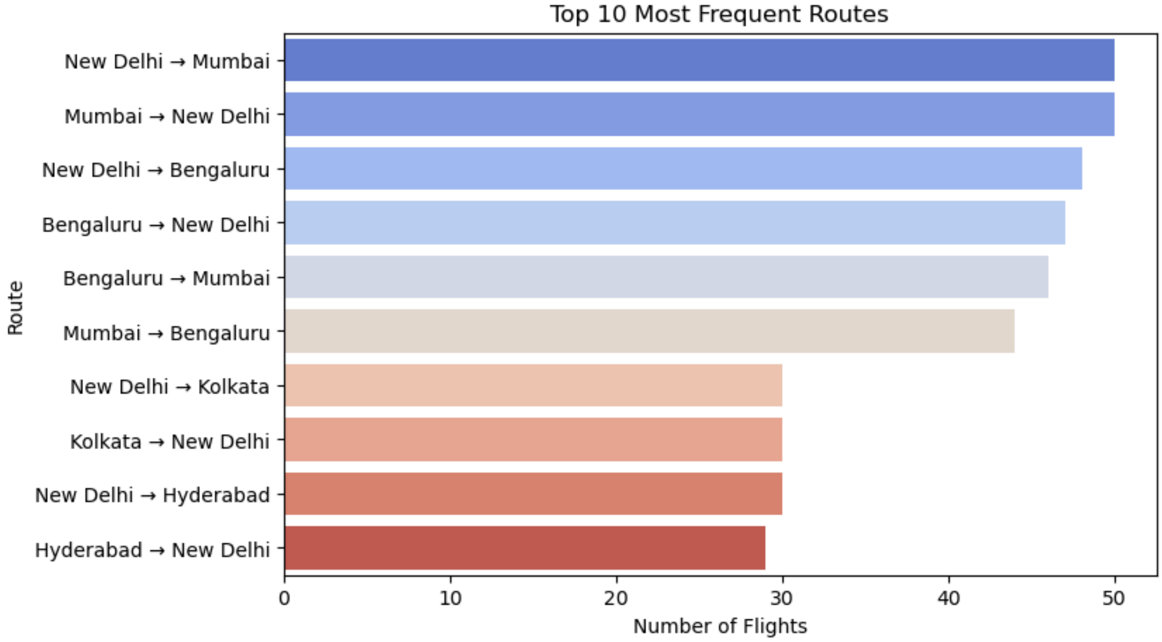
```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\69485880.py:2: FutureWarni
ng:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.boxplot(x='DepartureHour', y='Price', data=df, palette='plasma')
```



Top 10 Routes

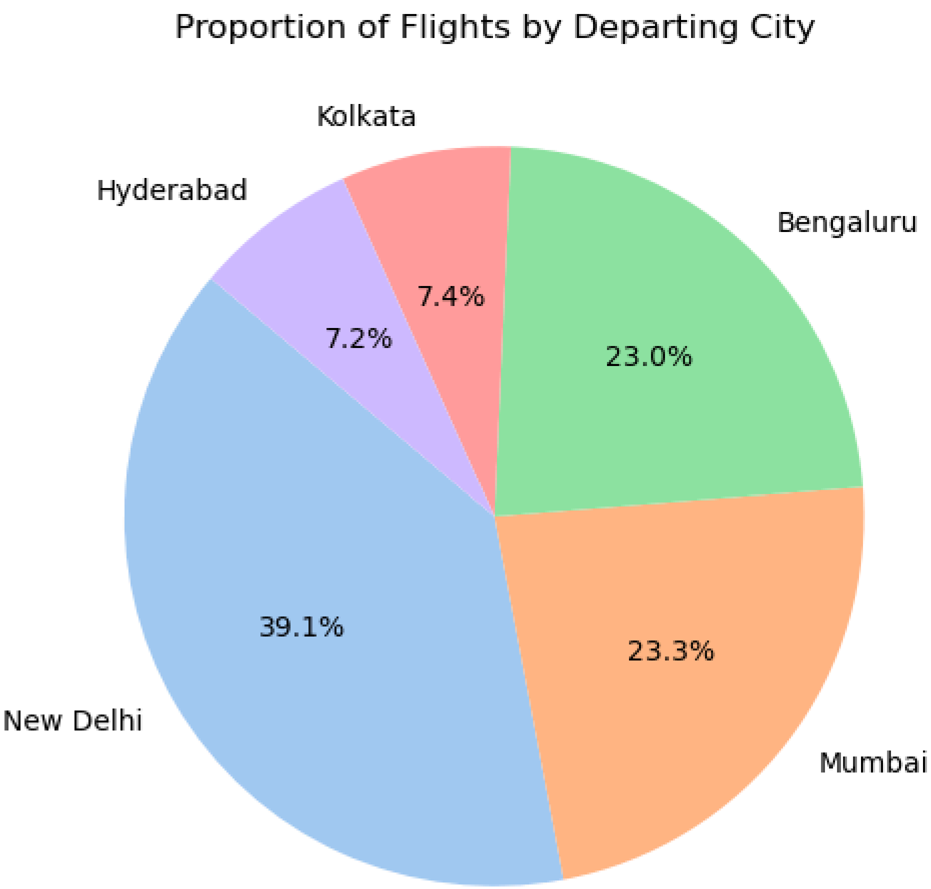
In [25]:
```
plt.figure(figsize=(8,5))
top_routes = df['Route'].value_counts().head(10)
sns.barplot(x=top_routes.values, y=top_routes.index, palette='coolwarm')
plt.title("Top 10 Most Frequent Routes")
plt.xlabel("Number of Flights")
plt.ylabel("Route")
plt.show()
```

```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\2883137815.py:3: FutureWar
ning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.barplot(x=top_routes.values, y=top_routes.index, palette='coolwarm')
```



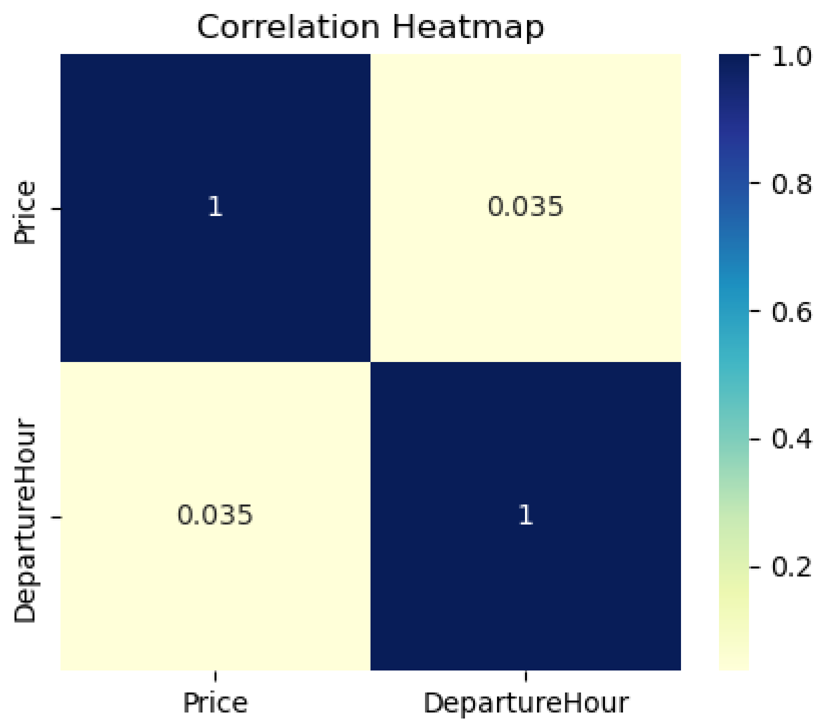
Proportion of Flights by Departing City

In [27]:
```
plt.figure(figsize=(6,6))
depart_counts = df['DepartingCity'].value_counts()
plt.pie(depart_counts.values, labels=depart_counts.index, autopct='%1.1f%%', sta
plt.title("Proportion of Flights by Departing City")
plt.show()
```



Exploring Correlation Between Price & Schedule Attribute

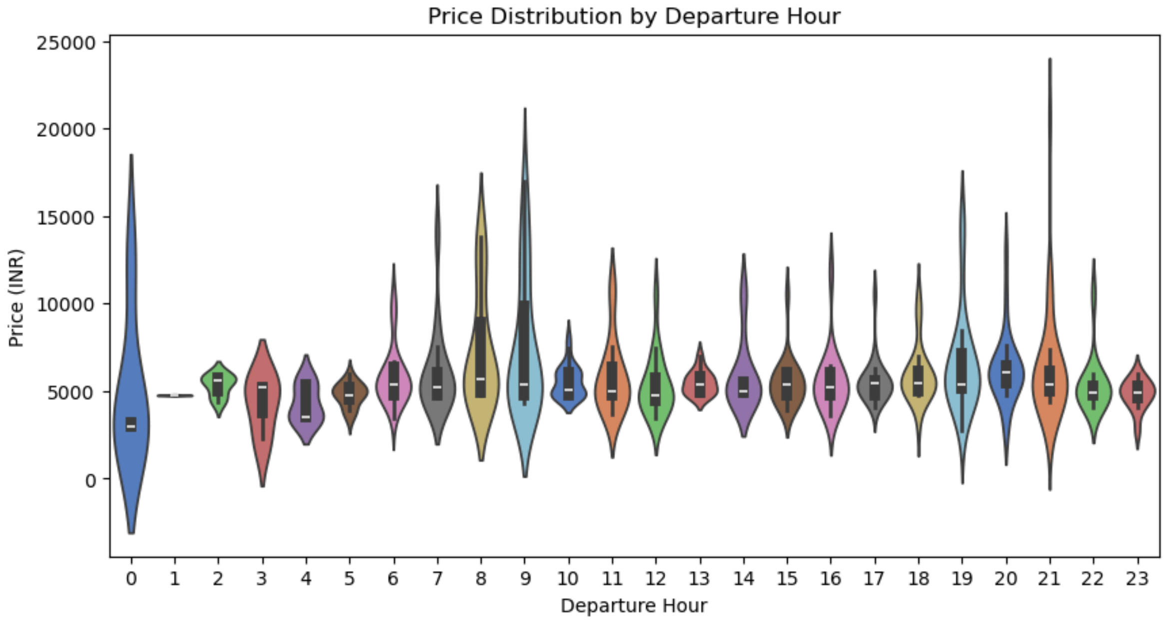
In [28]:
```
plt.figure(figsize=(5,4))
corr = df[['Price', 'DepartureHour']].corr()
sns.heatmap(corr, annot=True, cmap='YlGnBu')
plt.title("Correlation Heatmap")
plt.show()
```



Distribution of Prices by Departure Hour

In [29]:
```
plt.figure(figsize=(10,5))
sns.violinplot(x='DepartureHour', y='Price', data=df, palette='muted')
plt.title("Price Distribution by Departure Hour")
plt.xlabel("Departure Hour")
plt.ylabel("Price (INR)")
plt.show()
```

```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\3170378440.py:2: FutureWar
ning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.violinplot(x='DepartureHour', y='Price', data=df, palette='muted')
```



Flight Prices per Departing City

In [30]:
```
plt.figure(figsize=(10,6))
sns.swarmplot(x='DepartingCity', y='Price', data=df, palette='Set2')
plt.title("Flight Prices across Departing Cities")
plt.xlabel("Departing City")
plt.ylabel("Price (INR)")
plt.xticks(rotation=45)
plt.show()
```

```
C:\Users\SHREYA DAS\AppData\Local\Temp\ipykernel_15488\1861346161.py:2: FutureWar
ning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v
0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effe
ct.

  sns.swarmplot(x='DepartingCity', y='Price', data=df, palette='Set2')
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 17.0% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 45.6% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 20.0% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 19.1% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 7.5% of the points cannot be placed; you may want to decrease the size of the
markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 48.1% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\categorical.py:3399: UserWarni
ng: 26.7% of the points cannot be placed; you may want to decrease the size of th
e markers or use stripplot.
  warnings.warn(msg, UserWarning)
```

Insights Summary

In [31]:
```
print("Key Insights:")
print("1️⃣ Majority of flights are concentrated in key cities like Delhi, Mumbai,
print("2️⃣ Prices are generally higher during certain hours of the day.")
print("3️⃣ Some airlines consistently show higher average prices.")
print("4️⃣ Most frequent routes involve major metro cities.")
```

```
Key Insights:
1️⃣ Majority of flights are concentrated in key cities like Delhi, Mumbai, and Ba
ngalore.
2️⃣ Prices are generally higher during certain hours of the day.
3️⃣ Some airlines consistently show higher average prices.
4️⃣ Most frequent routes involve major metro cities.
```

Save Cleaned Dataset

In [32]:
```
df.to_csv("Cleaned_Flight_Data.csv", index=False)
print("✅ Cleaned dataset saved successfully.")
```

```
✅ Cleaned dataset saved successfully.
```

Conclusion

This project successfully performed Exploratory Data Analysis on Indian flight ticket prices. Various visualizations helped analyze price distribution, airline pricing patterns, departure city trends, and time-based price fluctuations. The analysis identified key routes, peak hours for pricing, and differences across airlines. This project can be extended further by applying machine learning models to predict flight prices based on historical data and additional features like holidays, seasons, and promotions.

In [ ]:

```

```