Here’s the detailed explanation and solution to each question in the assignment:

**Q1: What is Matplotlib? Why is it used? Name five plots that can be plotted using the Pyplot module of Matplotlib.**

**Answer**:

* **Matplotlib**: A popular Python library used for creating static, interactive, and animated visualizations. It provides a flexible platform for creating a wide variety of plots.
* **Usage**: Matplotlib is used for visualizing data to understand trends, patterns, and relationships. It is widely used in data analysis and data science workflows.
* **Five plots using Pyplot**:
  1. Line plot
  2. Scatter plot
  3. Bar plot
  4. Histogram
  5. Box plot

**Q2: What is a scatter plot?**

* A **scatter plot** displays points that represent values for two variables. It shows the relationship or correlation between these variables.

**Code and Plot**:

import numpy as np

import matplotlib.pyplot as plt

# Generate data

np.random.seed(3)

x = 3 + np.random.normal(0, 2, 50)

y = 3 + np.random.normal(0, 2, len(x))

# Plot scatter plot

plt.scatter(x, y, color='blue')

plt.title("Scatter Plot of Generated Data")

plt.xlabel("X-axis")

plt.ylabel("Y-axis")

plt.show()

**Q3: Why is the subplot() function used?**

* The **subplot()** function in Matplotlib is used to create multiple plots in a single figure. It allows arranging plots in a grid-like structure for better comparison and visualization.

**Code and Plot**:

import numpy as np

import matplotlib.pyplot as plt

# Data

x = np.array([0, 1, 2, 3, 4, 5])

y1 = np.array([0, 100, 200, 300, 400, 500])

y2 = np.array([50, 20, 40, 20, 60, 70])

y3 = np.array([10, 20, 30, 40, 50, 60])

y4 = np.array([200, 350, 250, 550, 450, 150])

# Subplots

plt.subplot(2, 2, 1) # First subplot

plt.plot(x, y1, label="Line 1", color='blue')

plt.title("Line 1")

plt.subplot(2, 2, 2) # Second subplot

plt.plot(x, y2, label="Line 2", color='orange')

plt.title("Line 2")

plt.subplot(2, 2, 3) # Third subplot

plt.plot(x, y3, label="Line 3", color='green')

plt.title("Line 3")

plt.subplot(2, 2, 4) # Fourth subplot

plt.plot(x, y4, label="Line 4", color='red')

plt.title("Line 4")

plt.tight\_layout()

plt.show()

**Q4: What is a bar plot? Why is it used?**

* A **bar plot** is a visualization that represents data in rectangular bars where the length corresponds to the data value. It is used to compare categorical data or track changes over time.

**Code and Plot**:

import numpy as np

import matplotlib.pyplot as plt

# Data

company = np.array(["Apple", "Microsoft", "Google", "AMD"])

profit = np.array([3000, 8000, 1000, 10000])

# Bar plot

plt.bar(company, profit, color='skyblue')

plt.title("Profit by Company")

plt.xlabel("Company")

plt.ylabel("Profit")

plt.show()

# Horizontal bar plot

plt.barh(company, profit, color='lightgreen')

plt.title("Profit by Company")

plt.xlabel("Profit")

plt.ylabel("Company")

plt.show()

**Q5: What is a box plot? Why is it used?**

* A **box plot** (or whisker plot) visualizes the distribution of data through their quartiles. It highlights the median, upper and lower quartiles, and potential outliers.
* **Usage**: To identify variability, detect outliers, and compare distributions across datasets.

**Code and Plot**:

import numpy as np

import matplotlib.pyplot as plt

# Data

box1 = np.random.normal(100, 10, 200)

box2 = np.random.normal(90, 20, 200)

# Box plot

plt.boxplot([box1, box2], labels=["Box 1", "Box 2"])

plt.title("Box Plot Example")

plt.ylabel("Values")

plt.show()