**Lab 3**

**Laboratory Problem Statements**

**Que1. Write a program to implement Mid-point Ellipse Drawing algorithm.**

**Code:**

from matplotlib import pyplot as plt

def midpointElipseDrawing(rx, ry):

  x = 0

  y = ry

  P = (ry\*\*2) + (rx\*\*2) / 4 - (ry\*rx)

  P2 = ((ry\*\*2) \* ((x + 1) / 2) \*\* 2) + ((rx\*\*2) \* (y - 1) \*\* 2) - ((rx\*\*2) \* (ry\*\*2))

  dx = 2\*(ry\*\*2)\*x

  dy = 2\*(rx\*\*2)\*y

  xCord = []

  yCord = []

  while(dx<=dy):

    if(P < 0):

      x += 1

      P += (ry\*\*2)\*(3+2\*x)

    else:

      x += 1

      y -= 1

    dx = 2\*(ry\*\*2)\*x

    dy = 2\*(rx\*\*2)\*y

    xCord.append(x)

    yCord.append(y)

  while(y>=0):

    if(P2 > 0):

      y -= 1

      P2 -= 2\*y\*(rx\*\*2) + (rx\*\*2)

    else:

      x += 1

      y -= 1

      P2 += 2 \* (ry \*\* 2) \* (2 \* x) - 2 \* y \* (rx \*\* 2) + (rx \*\* 2)

    xCord.append(x)

    yCord.append(y)

  xfinal = []

  yfinal = []

  for x, y in zip(xCord, yCord):

      xfinal.append(x)

      yfinal.append(y)

      xfinal.append(-x)

      yfinal.append(y)

      xfinal.append(-x)

      yfinal.append(-y)

      xfinal.append(x)

      yfinal.append(-y)

  if(rx > ry):

    plt.scatter(xfinal, yfinal, color='blue')

  else:

    plt.scatter(yfinal, xfinal, color='blue')

  plt.grid(True)

  plt.title("Midpoint Ellipse Drawing Algorithm", fontsize=14, pad=20)

  plt.grid(True)

  plt.title("Midpoint Elipse Drawing Algorithm", fontsize=14, pad=20)

  ax = plt.gca()

  ax.set\_facecolor('white')

  ax.spines['top'].set\_color('orange')

  ax.spines['bottom'].set\_color('orange')

  ax.spines['left'].set\_color('orange')

  ax.spines['right'].set\_color('orange')

  ax.spines['top'].set\_linewidth(2)

  ax.spines['bottom'].set\_linewidth(2)

  ax.spines['left'].set\_linewidth(2)

  ax.spines['right'].set\_linewidth(2)

  plt.show()

midpointElipseDrawing(3, 4)

**Output:**

