Computer Graphics Lab - CS352

Weekly Assignment Report

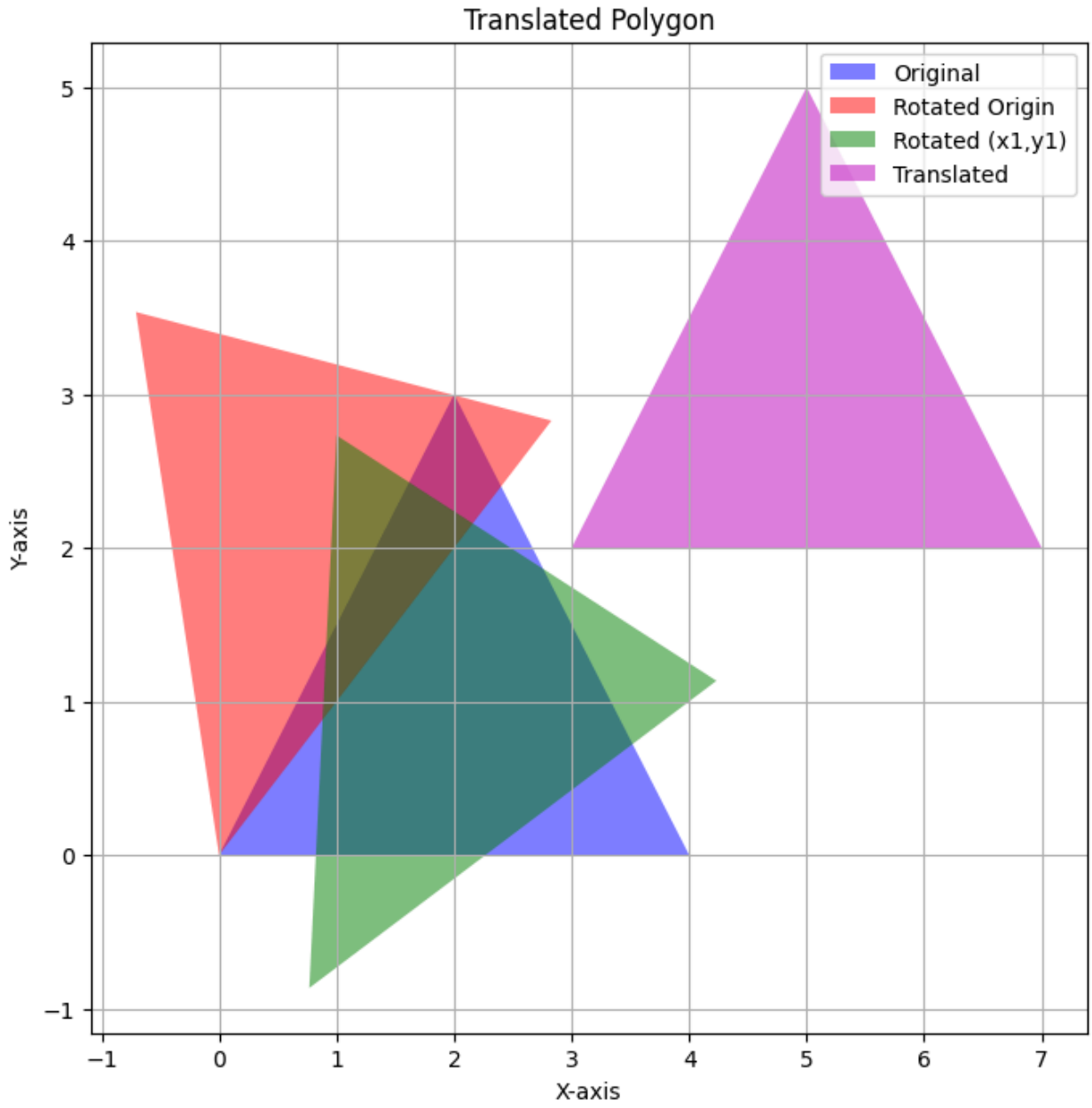
Question:

```python
import numpy as np
import matplotlib.pyplot as plt


def get_polygon():
    n = int(input("Enter the number of vertices: "))
    points = []
    for i in range(n):
        x, y = map(float, input(f"Enter vertex {i+1} (x y): ").split())
        points.append((x, y))
    return np.array(points)


def rotate_polygon(points, angle, pivot=(0, 0)):
    angle_rad = np.radians(angle)
    cos_a, sin_a = np.cos(angle_rad), np.sin(angle_rad)
    rotation_matrix = np.array([[cos_a, -sin_a], [sin_a, cos_a]])

    translated_points = points - pivot  # Move pivot to origin
    rotated_points = np.dot(translated_points, rotation_matrix.T)
    return rotated_points + pivot  # Move back
```

```
def translate_polygon(points, translation):
    return points + translation

def plot_polygon(points, title, color='b'):
    closed_points = np.vstack([points, points[0]])  # Close the polygon
    plt.fill(closed_points[:, 0], closed_points[:, 1], color+'o-', alpha=0.5)
    plt.title(title)
    plt.xlabel("X-axis")
    plt.ylabel("Y-axis")
    plt.grid(True)
def main():
    polygon = get_polygon()
    plt.figure(figsize=(8, 8))
    plot_polygon(polygon, "Original Polygon", 'b')

    angle_A = float(input("Enter the rotation angle A (degrees) about the
origin: "))
    rotated_origin = rotate_polygon(polygon, angle_A)
    plot_polygon(rotated_origin, "Rotated about Origin", 'r')

    x1, y1 = map(float, input("Enter the point (x1, y1) for rotation:
").split())
```

```
    angle_B = float(input("Enter the rotation angle B (degrees) about (x1, y1):
"))

    rotated_pivot = rotate_polygon(polygon, angle_B, pivot=(x1, y1))

    plot_polygon(rotated_pivot, "Rotated about (x1, y1)", 'g')


    X2, Y2 = map(float, input("Enter translation coordinates (X2, Y2):
").split())

    translated = translate_polygon(polygon, np.array([X2, Y2]))

    plot_polygon(translated, "Translated Polygon", 'm')


    plt.legend(["Original", "Rotated Origin", "Rotated (x1,y1)", "Translated"],
loc='upper right')

    plt.show()


main()
```

Output:



Colab link for code is here