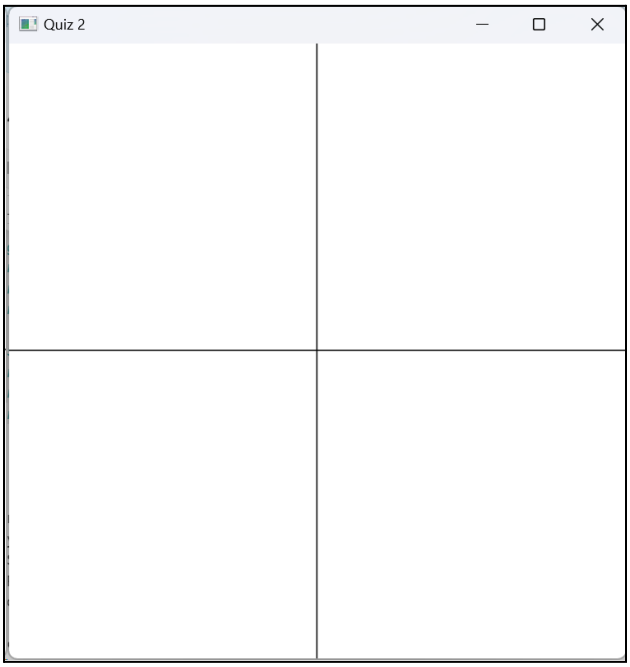
FLAME UNIVERSITY

# Fundamentals of computer graphics (CSIT304)
## Quiz 1 (30 January 2024)

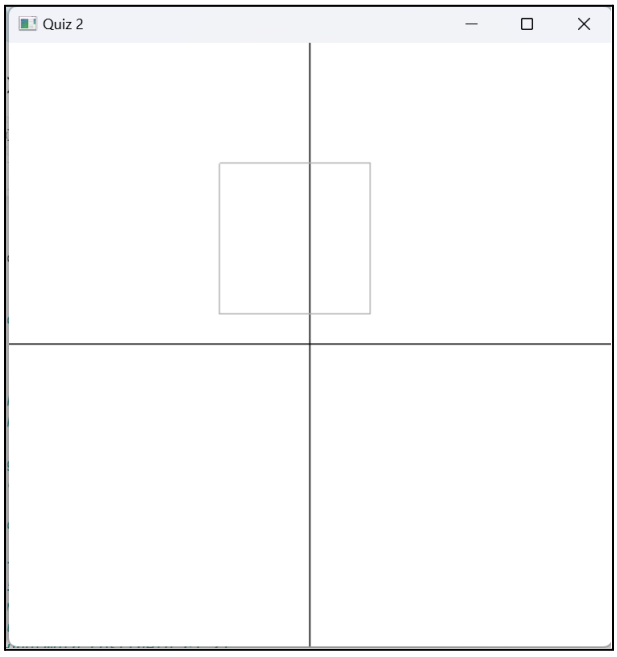
Marks are mentioned towards the right margin.

---

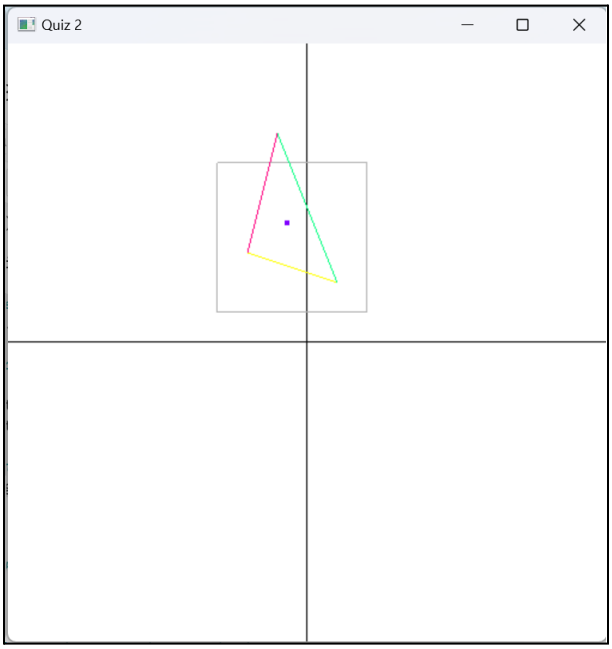
1. Write a code to generate a 2D coordinate system, and draw the axis. The specifications are as follows: x-left = -10, x-right = 10, y-bottom = -10, y-top = 10. Render the coordinate system as shown below. **[Code]** 2 Marks




2. There is a clipping window with the following specifications: x_max = 2.0, y_max = 6.0, x_min = -3.0, y_min = 1.0. Render the clipping window on the coordinate system of Q1 as per the following image. **[Code]** 1 Mark



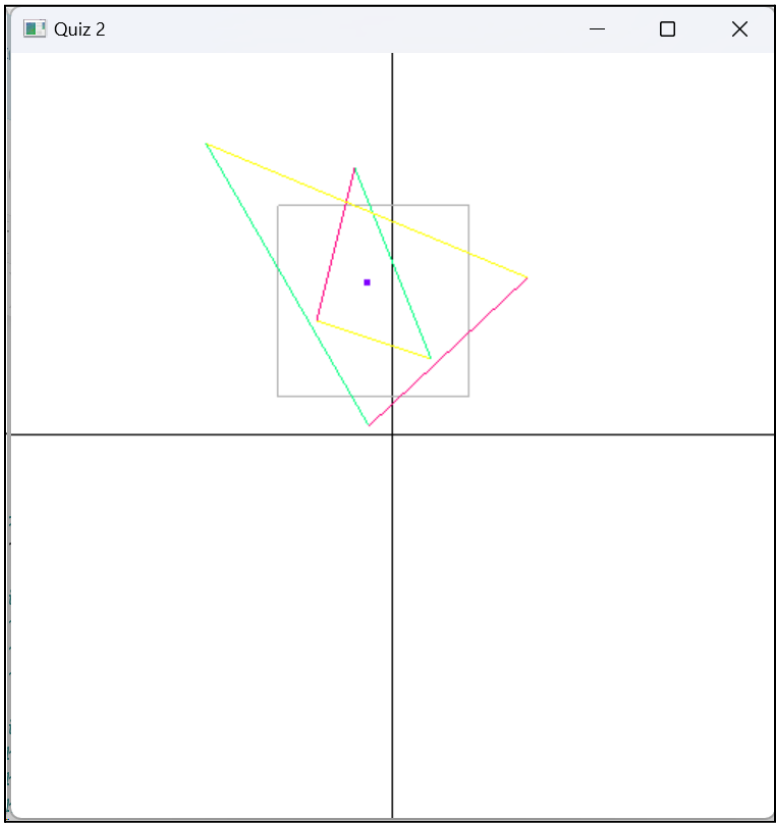

3. Consider a triangle with the vertices located at (-2,3), (1,2), (-1,7).
    a. Calculate the centroid of the triangle **[Pen and Paper].** 1 Mark
    b. Plot the triangle and the centroid in the coordinate system of Q1 and render them as shown in the following figure. **[Code]** 1 Mark
    [Don't recalculate the centroid in your code, hard code the value of 2.a]
    [Use different colors for each side. Choice of color is yours.]




4. Suppose the triangle is to be rotated by angle θ degree about the centroid, and scaled by a times along x axis and b times along y axis. Determine the transformation matrix for the composite transformation. You are free to name the variable and transformation

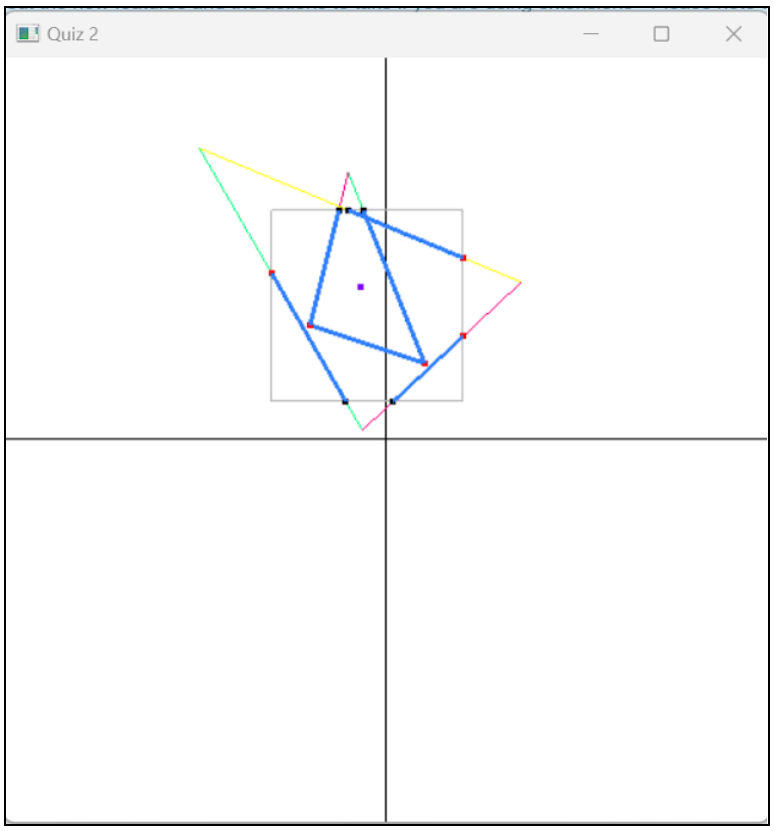
parameters as per your choice. **[Pen and Paper].** 3 Marks

5. Suppose the composite matrix you derived for Q4 is T. Then apply T on the triangle and generate the transformed triangle coordinates. The parameters are given by: θ=-75 degree, a=3, b= 1.2. Plot the transformed triangle as shown below. **[Code]** 2 Marks




6. Next Task is to use Cohen-Sutherland line clipping algorithm to clip each line of the triangle. For that Calculate the end-point code for all the sides of the original and transformed triangle. **[Pen and Paper].** 2 marks
[Hint: Use the coordinate given in Q3 and the transformed coordinates you got from Q5, w.r.to the window given in Q2]

7. Use the end point codes you got from Q6 and apply Cohen-Sutherland algorithm to get the intersection points. Don't recalculate the end-codes in your code. Hard-Code them as per the calculation of your answer sheet. Highlight the intersection points, and the visible portion of the lines as shown below. 3 marks




8. In the class we discussed the Sutherland-Hodgeman Polygon clipping code. Demonstrate how the polygons (Triangles (before and after transformation) in this case) will be clipped. **[Code]** 2 marks
   [Hint: The intersection points should match in case of Q7 and Q8]

9. In some cases, certain combinations of rotations and reflections in 3D may result in a simpler or equivalent transformation, depending on the specific scenario. Explain with an example to justify the statement with calculation.**[Pen and Paper]** 3 marks