FLAME UNIVERSITY

Fundamentals of computer graphics (CSIT304)

Quiz 1 (30 January 2024)

Marks are mentioned towards the right margin..

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1. Derive the matrix that represents scaling of an object with respect to any fixed point? Given P(6, 8) , Sx = 2, Sy = 3 and fixed point (2, 2). Use the matrix you derived to find the transformed coordinate P'? 2+2 = 4 marks

2. Find the equation of the circle $p^2 + q^2 = 1$ in terms of xy coordinates, assuming that the pq coordinate system results from a scaling of a units in the x direction and b units in the y direction. 2 marks

3. In the derivation of Bresenham's line algorithm we have used s and t to measure the closeness of pixels S and T to the true line. However, s and t are only distances in the y direction. They are not really distances between a point to a line as defined in geometry. Can we be sure that, when s = t, the two pixels S and T are truly equally far away from the true line (hence we can choose either one to approximate the line)? 2 marks

4. While calculating the decision variable for a line (m <1) we multiply the difference between s and t, i.e., (s-t) with Δx. What are the 2 reasons behind that? 2 marks

5. For a scanline polygon filling algorithm, what are the parameters we store in the node data structure for the AET and why? 3 marks

6. What is the key difference between raster and vector graphics and which one is computationally faster for resizing and transformations and why? 2 marks

7. In the class we derived the Mid-Point Circle drawing algorithm where the point $(x_k + 1, y_k - 0.5)$ was checked with the function $F(x, y) = x^2 + y^2 - r^2 = 0$ to see if the value of the function is 0 (on the circle), -ve (inside the circle), and +ve (outside the circle). Based on that understanding, derive a Midpoint Line ($y = mx + c$) drawing algorithm for the slope m<1. 5 marks