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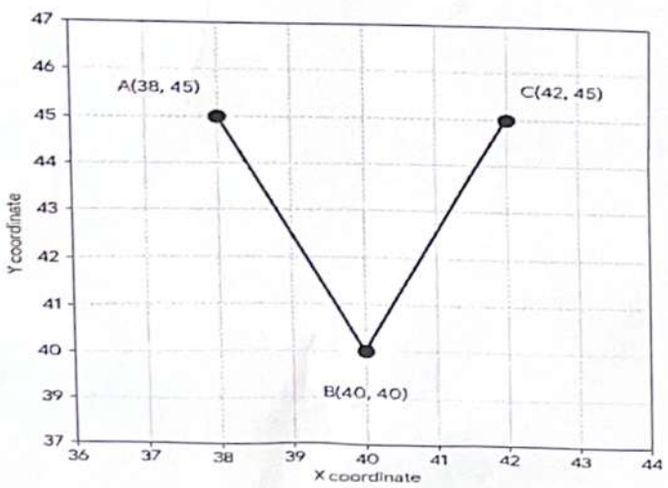
Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Midterm Examination, Spring 2026
Course Code: CSE421, Course Title: Computer Graphics
Level: 4, Term: 3, Batch: 62 & 63

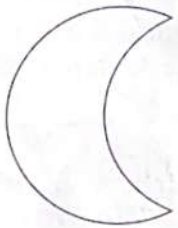
Time: 01:30 Hrs **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	**a)**	A CAD application renders thin diagonal edges of mechanical parts on a raster display. When zoomed out, the edges appear visually acceptable, but during zoom-in and rotation operations, strong jagged artifacts and moiré-like patterns become visible. To address this issue, the system designers consider three solutions: uniformly increasing the rendering resolution, computing pixel intensities based on the exact area of overlap between the edge and each pixel, and rendering the scene on a dense virtual sampling grid followed by low-pass filtering before final display. From this scenario, identify the anti-aliasing technique represented by each solution and explain the working principles of any two of them.	[5]	**CO1**
	b)	Explain the derivation of the 2D rotation transformation matrix for rotating a point about the origin by an angle θ.	[3]	
2.		Suppose we want to draw a V-shaped figure on a raster display. For this purpose, we have taken three points: A (38, 45), B (40, 40), and C (42, 45). The V-shape is formed by joining the line segments AB and BC.  Apply Bresenham's Line Drawing Algorithm to determine the corresponding pixel points and draw the line segments AB and BC of the V-shaped figure.	[7]	**CO2**

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3.	Suppose we want to draw a lens-shaped figure using a raster display. For this purpose, we have taken two circles of equal radius 10 units, centered at (6, 0) and (-6, 0), respectively. We have trimmed the inner overlapping portions of both circles so that only the outer arcs remain, forming a shape similar to the given figure. Now, analyze the Midpoint Circle Drawing Algorithm to determine the pixel points of the required arcs and plot the tentative shape. 	[7]	CO2
4.	Consider a 3D shape with initial coordinates A(-2,3,-1), B(1,3,-1), and C(1,-2,3). After applying a rotation of θ degrees about the X-axis, the new coordinates become A'(-2,3,-1), B'(1,3,-1), and C'(1,-2,3). Using the X-axis rotation transformation matrix, analyze the transformation and discover the value of the rotation angle θ.	[3]	CO2