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MCS-053

MCA (Revised)
Term-End Examination
June, 2018

06685

MCS-053 : COMPUTER GRAPHICS AND MULTIMEDIA

Time : 3 hours *Maximum Marks : 100*

Note : *Question number **1** is **compulsory**. Attempt any **three** questions from the rest.*

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1. (a) Differentiate between 'Display buffer' and 'Frame buffer'. How is the frame buffer used to control the intensity of pixels ? Use a suitable diagram/table to discuss the intensity control by frame buffer. *5*

(b) Explain the Sutherland-Hodgman Polygon Clipping algorithm. Give a suitable diagram in support of your explanation. *5*

(c) Write DDA algorithm. Use it to draw a line segment joining points (4, 8) and (8, 10). *5*

(d) Compare and contrast between Perspective projection and Parallel projection. Give a suitable diagram for each. *5*

(e) Write the Rotational Transformation matrix for a 2D Euclidean system, for clockwise and anticlockwise rotations by θ. Also verify the statement "A clockwise rotation by angle θ, followed by an anticlockwise rotation for the same angle θ, leads to identity matrix." *5*

(f) Differentiate between Gouraud and Phong shading. Give suitable diagrams and expressions for comparison. *5*

(g) Briefly describe any ***two*** of the following file formats : *5*

(i) jpeg
(ii) tiff
(iii) gif

(h) Explain the Area Subdivision algorithm. Use a suitable diagram to support your explanation. *5*

2. (a) What are the advantages of homogeneous coordinate system over Euclidean coordinate system ? Perform the following transformations on the square (ABCD) whose coordinates are A(0, 0), B(0, 2), C(2, 0) and D(2, 2) :

(i) Scale up the square ABCD by 2 units in x-direction and 3 units in y-direction.

(ii) Rotate ABCD by 45° in anticlockwise direction.

(iii) Translate ABCD by 3 units in x-direction and 5 units in y-direction.

What are the final coordinates of vertices A, B, C and D of the square ? *10*

(b) Determine the perspective transformation matrix when a point P(x, y, z) is projected on z = 4 plane, and viewed from E(−6, 0, 0). Draw a proper diagram to show the entire process of projection. *8*

(c) Give one similarity and one difference between orthographic projection and oblique projection. *2*

3. (a) Discuss the Cyrus-Beck Line Clipping algorithm. Compare it with the Cohen-Sutherland Line Clipping algorithm. Derive the expression for the parameter (t) used for clipping the line using the Cyrus-Beck Line Clipping algorithm. *10*

(b) Write the Mid-point Circle algorithm. Compute the coordinate points of the circle drawn with centre at (0, 0) and radius of 5 units, using the Mid-point Circle algorithm. *5*

(c) Discuss the term Windowing Transformations. Use suitable diagrams and expressions in your discussion. *5*

4. (a) Prove the following properties of a Bezier curve : *5*

(i) $P(u = 1) = P_n$

(ii) $P'(0) = n(P_1 - P_0)$

(b) What are Parametric Continuities ? Discuss each type of parametric continuity. Give mathematical expression and diagram for each type. *7*

(c) Write the pseudocode of the Z-buffer algorithm for visible surface detection. What is the maximum number of objects that can be handled by the Z-buffer algorithm ? Give two advantages and two disadvantages of the Z-buffer algorithm. *8*

5. (a) How do we simulate acceleration in animation ? Write the mathematical function used to regulate frame spacing in simulating the following :

(i) Zero Acceleration

(ii) Positive Acceleration

(iii) Negative Acceleration

(iv) Mixed Acceleration

Draw a graph to illustrate the frame spacing regulation for each type of simulated animation. *10*

(b) Write short notes on any ***two*** of the following : *10*

(i) Ray Casting

(ii) Authoring Tools

(iii) Polygon Representation Methods