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December 2022

BCA- V SEMESTER

Computer Graphics (BCA-17-302)

Time: 3 Hours **Max. Marks:75**

Instructions:

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Generate the set of points that will be plotted if the point (x,y) has been recently generated in an octant when scan-converting a circle (1.5)

(b) Prove that two scaling transformations commute. (1.5)

(c) Which of the following is not rigid body transformation? (1.5)
(i)reflection (ii) Rotation (iii)translation (iv)Shearing

(d) What is the size in bytes of the frame buffer needed for a raster system of 1024× 1024 to store 24 bits per pixel? (1.5)

(e) Develop the composite matrix to perform window to viewport transformation (1.5)

(f) What do you mean by homogeneous coordinates? Why is it useful ? (1.5)

(g) Differentiate between Affine and Rigid Body transformations. (1.5)

(h) How can we determine if the two curves are connected or not ? (1.5)

(i) What is the need of 3-D clipping algorithms? (1.5)

(j) Differentiate between flood fill and boundary fill algorithms. (1.5)

PART -B

Q2 (a) The coordinates of the vertices of a polygon are as V1(2,4), V2(9,4), V3(9,7), V4(8,7), V5(8,9), V6(4,9), V7(4,7), V8(2,7). Write the initial edge list for the polygon. State which scan lines will be active on scan lines y=6,7,8,9 and 10 (10)

(b) What is a Graphics pipeline ? Explain the operational organization of 2-D pipeline . (5)

Q3 (a) Write the general form of scaling matrix with respect to a fixed point P(h,k) (5)

(b) A Bezier cubic curve with control points P0, P1, P2 and P3 is defined by the Equation (10)

$$P(t) = P_0 B_0^3(t) + P_1 B_1^3(t) + P_2 B_2^3(t) + P_3 B_3^3(t)$$

What is the value of $B_2^3(t)$?

Q4 Find the mirror reflection of the triangle P(10, 50), Q(40, 60), R(10, 80) about X-axis. Also work out the transformation to rotate the above triangle about the point P clockwise by 90°. (15)

Q5 (a) Give different application areas of computer Graphics. (5)

(b) How is Phong model different from Gouraud shading model? (10)

Q6 (a) Explain and compare the different colour models (5)

(b) Differentiate between Raster Scan and Random Scan method (5)

(c) Write short notes on Bezier and B-Spline surfaces. (5)

Q7 Discuss the Cohen –Sutherland Line clipping algorithm. Draw a picture to show the worst-case scenario (one that involves maximum number of clipping iterations) in the implementation of the algorithm. (15)

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