

Computers Graphics & Multimedia
(CSEN 6158)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following: 10 x 1=10
- (i) If in CMY color model if blue is represented by 110 then green is represented as
(a) 101 (b) 001 (c) 001 (d) 011.
- (ii) The basic principle of Bresenham's line drawing algorithm is
(a) to select the optimum raster locations to represent a straight line
(b) to select either Δx or Δy , whichever is larger, chosen as one raster unit
(c) to find on which side of the line the midpoint lies
(d) both a and b.
- (iii) Two consecutive scaling transformation t_1 and t_2 are
(a) Additive (b) Subtractive
(c) Multiplicative (d) None of these.
- (iv) After performing a 45° rotation of a triangle $A(0,0), B(1,1), C(5,2)$ about the origin, the co-ordinates of the vertices ABC are
(a) $A(0, -\sqrt{2}), B(3/2\sqrt{2}, 7/2\sqrt{2}), C(0,0)$ (b) $A(0,0), B(0, -\sqrt{2}), C(3/2\sqrt{2}, 7/2\sqrt{2})$
(c) $A(0,0), B(0,\sqrt{2}), C(3/2\sqrt{2}, 1/2\sqrt{2})$ (d) $A(0,0), B(3/2\sqrt{2}, 7/2\sqrt{2}), C(5,2)$.
- (v) The Bezier curve obtained from the four control points is called a
(a) Square Bezier curve (b) Cubic Bezier curve
(c) Hectare Bezier curve (d) Rectangle Bezier curve.
- (vi) A 24-bit plane colour frame buffer with three 10 bit wide colour look-up Tables can havenumber of colours.
(a) 2^{24} (b) 2^8 (c) 2^{30} (d) 2^{48} .
- (vii) Refresh rate is
(a) the rate at which the number of bit planes are accessed at a given time
(b) the rate at which the picture is redrawn
(c) the rate at which the aliasing takes place
(d) the rate at which the contents of frame buffer is sent to the display monitor

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- (viii) Lossy image simplification is based on operation
(a) DCT (b) CCIT (c) ISO (d) DMS.
- (ix) How many channels are specified by MID standard?
(a) 16 (b) 24 (c) 32 (d) None of these.
- (x) A technique by which the vertical and /or horizontal scan frequency of video signal can be changed for different purpose and applications is called
(a) Scan conversion (b) Polygon filling
(c) Two dimensional graphics (d) Anti aliasing.

Group - B

- (a) Derive the algorithm for scan conversion of ellipse($x^2/a^2+y^2/b^2=1$) using midpoint method.
- (b) Given input ellipse parameters $a=7$ and $b=5$, illustrate the steps in the midpoint ellipse algorithm by determining raster positions along the ellipse path in the 1st quadrant.
7 + 5 = 12

(a) Write boundary fill algorithm for region filling. Compare and contrast the boundary fill algorithm and flood fill algorithm.

- (b) Using midpoint circle drawing algorithm, draw a circle with origin at (1,1) and radius 8 unit.
7 + 5 = 12

Group - C

(a) Derive the 3-D transformation matrix for rotating an object by an angle in a direction of YZ plane.

(b) Derive reflection transformation matrix in 2-D along a general line $y=mx+c$.

(c) Is there any difference between windowing and view port? Answer with justification.
6 + 4 + 2 = 12

(a) Why line clipping algorithms are not used for clipping a polygon on line to line basis? Explain in detail Sutherland-Hodgeman polygon clipping algorithm.

(b) Let R be a rectangle window whose lower left corner is at (-3, 1) and upper right corner is at (2,6). Clip the following line segments.

- (i) AB A(-1,5) B(3,8)
(ii) CD C(-4,2) D(-1,7)

7 + 5 = 12

Group - D

6.(a) Find the equation a Bezier curve that passes through the end points P1(0,0) and P4(-2,1) and is controlled by the intermediate points P2(7,5) and P3(2,0).

(b) Calculate the coordinates of the point on the curve corresponding to the parameter $t=0.3, 0.5$ Draw the rough sketch of the curve and show coordinates of various point on it.
6 + 6 = 12

7.(a) Explain the Z-Buffer algorithm. What are the advantages of using the z-buffer algorithm?

(c) Four points P0(a,b), P1(20,50), P2(40,40), P3(70,c) are available for drawing a B-Spline curve segment. Compute the values of a, b, c such that the curve starts from the point (21,43) and terminates with slope (-1/2).
6 + 6 = 12

Group - E

8.(a) What does Nyquist's Sampling Theorem state? What are the implications of Nyquist's Sampling Theorem for multimedia data?

(b) Calculate the uncompressed digital output if a video signal is sampled using the following values: 25 frames per second 160 x 120 pixels True (Full) colour depth.

(c) What is MIDI? How is a basic MIDI message structured?
5 + 2 + 5 = 12

9.(a) What is an R-tree? State and explain insertion algorithm in an R-Tree.

(b) Explain the differences between an R tree and a quad tree.
8 + 4 = 12