

Total No. of Questions : 10] [Total No. of Printed Pages : 3

Roll No.

MCA-403(N)

M. C. A. (Fourth Semester) EXAMINATION, June, 2008

(New Course)

COMPUTER GRAPHICS AND MULTIMEDIA

[MCA-403(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt *one* question from each Unit. All questions carry equal marks.

Unit-I

1. (a) Explain with neat diagram working of refresh CRT. 10
- (b) Write DDA algorithm for line drawing and calculate pixels that will be used to draw line between (2, 3) and (4, 4). 5, 5

Or

2. (a) Explain with neat diagram working of plasma panel as a display device. 10
- (b) Explain with an example the working of Bresenham's mid point circle drawing algorithm. Choose a circle and calculate pixels in the path of this circle in only first quadrant. 10

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Unit – II

3. (a) Explain basic principle used in scan line polygon fill algorithm. 10
- (b) A triangle with vertices (0, 0), (0, 3) and (3, 0) is rotated in anticlockwise direction to an angle of 30 degrees about its centroid. Calculate new co-ordinates of vertices. 10

Or

4. (a) Define resolution of a CRT display. What is aliasing ? Explain any two techniques to remove this problem. 2, 8
- (b) A square with vertices (0, 0), (2, 0), (2, 2) and (0, 2) is scaled to 2 units in x as well as y direction about the fixed point which is centre of square. Find co-ordinates of vertices of new square. 10

Unit – III

5. (a) A window with vertices (3, 0), (5, 0), (5, 4), (3, 4) is to be mapped on to a view port with vertices (0.5, 0.5), (1.0, 0.5), (1.0, 1.0), (0.5, 1.0). Derive necessary viewing transformation. 10
- (b) What is clipping ? Describe Cohen-Sutherland bit code method of testing totally visible lines. 2, 8

Or

6. (a) Describe Sutherland-Cohen subdivision line clipping algorithm. 10
- (b) Define the terms light sources, ambient light and diffuse reflections. Give salient features of Phong specular reflection model. 5, 5

Unit – IV

7. (a) Define the terms polygon surfaces, polygon data tables and quadric surfaces and explain each with examples. 4, 6

- (b) Define perspective projection and derive transformation matrix for perspective projection. 2, 8

Or

8. (a) Define control points and blending functions for Bezier curves. Derive cubic Bezier curves (blending functions) for four control points and discuss the properties of each blending function. 2, 8
- (b) Given a parallelopiped with vertices
 A (0, 0, 0), B (1, 0, 0), C (1, 2, 0), D (0, 2, 0),
 E (0, 2, 3), F (0, 0, 3), G (1, 0, 3) and H (1, 2, 3).
 Calculate transformed vertices under perspective projection when object is observed from point (0, 0, 10). 10

Unit – V

9. (a) If 15 minutes of stereo music is stored in MIDI format as well as WAV format, with 16 bit resolution @ 44.1 kHz then what would be storage requirement of two files. 10
- (b) What are components of a multimedia system ? Describe typical formats in which the data of different components are stored in a computer. How are these linked with each other ? 10

Or

10. Write short notes on any *three* of the following : 20
- Elements of hypertext
 - Multimedia tools
 - Multimedia file formats (any *three*)
 - Multimedia hardware
 - Authoring tools

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Roll No.

MCA-403(O)

M. C. A. (Fourth Semester) EXAMINATION, June, 2008
(Old Course)

COMPUTER GRAPHICS

[MCA-403(O)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any five questions. All questions carry equal marks.

1. (a) What is the importance of computer graphics in present scenario ? Describe in brief about some of the major application areas of its use.
(b) Compare raster and random scan display. Consider three different raster systems with resolutions of 640 by 480, 1280 by 1024 and 2560 by 2048. What size frame buffer is needed for each of these systems to store 24 bits per pixel ?
2. (a) List the operating characteristics for the following display technologies : raster refresh system, plasma panels, LCDS.
(b) Develop Bresenham's circle drawing algorithm for drawing a circular arc of radius R centered at (0, 0)

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starting from $(R, 0)$ and Lying in the fourth quadrant between 0 and -45° .

3. (a) Differentiate between flood fill and boundary fill algorithms. Apply the stack based seed fill algorithm to fill the polygon defined by the vertices $(1, 1)$, $(1, 4)$, $(3, 6)$, $(8, 6)$ and $(8, 1)$. The seed pixel is at $(4, 3)$ and polygon is boundary filled.
(b) Write a detailed note on various graphics file formats.
4. (a) Derive general transformation matrix for fixed point scaling and fixed point rotation.
(b) Find the transformation matrix that transform the given square ABCD to half its size with centre still remaining at the same position. The coordinates of the square are A $(1, 1)$, B $(3, 1)$, C $(3, 3)$, D $(1, 3)$ and centre at $(2, 2)$.
5. (a) What transformation is needed to carry out window-to-viewport mapping ? Using it find normalized transformation that maps window whose left bottom corner is at $(1, 1)$ and upper right corner at $(3, 5)$ and viewport that has a lower left corner at $(0, 0)$ and upper right corner at $(1/2, 1/2)$.
(b) What is Clipping ? Describe Cohen-Sutherland line clipping algorithm and use it to clip the line from $(-3/2, 1)$ to $(3/2, 2)$ against the window :
 $(-1, -1)$, $(-1, 1)$, $(1, -1)$, $(1, 1)$
6. (a) A unit cube is projected onto the XY plane under perspective projection with centre of projection being $(0, 0, -10)$. Draw the projected image of the cube. Determine the vanishing point for this transformation.

- (b) A cubic Bezier curve segment is described by the control points $P_1 (20, 20)$, $P_2 (40, 80)$, $P_3 (80, 80)$, $P_4 (90, 50)$. Another curve is described by $Q_1 (a, b)$, $Q_2 (c, 20)$, $Q_3 (150, 20)$, $Q_4 (180, 20)$. Determine the values of a , b and c so that the two curve segments join smoothly.
7. (a) Describe depth buffer method for displaying visible surfaces of a number of objects in the scene.
- (b) What is the basic purpose of interactive input devices ? What are the four basic functions provided by these input devices ? Describe the salient features of touch panel.
8. Write short notes on the following :
- (a) B-spline curve
 - (b) Gouraud shading
 - (c) Specular and diffuse reflection
 - (d) Logical classification of input devices

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M. C. A. (Fourth Semester) EXAMINATION, Dec., 2006

COMPUTER GRAPHICS

(MCA-403)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any five questions. All questions carry equal marks.

1. (a) What is Computer Graphics ? Indicate *four* practical applications of computer graphics. 2, 8
- (b) Give the logical classification of interactive graphical input devices and discuss with neat diagram the working of light pen. 5, 5
2. (a) Discuss the working principles of colour CRT. How do we achieve full colour frame buffer ? Discuss in detail. 5, 5
- (b) Distinguish between Random scan system and Raster scan system. Discuss the implementation of grey level Raster scan display. 4, 6

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3. (a) What are the drawbacks of DDA line drawing algorithm ? How are they minimized or removed in Bresenham's algorithm ? 2, 2
- (b) Write circle generation mid point algorithm and use it to indicate which raster locations would be chosen in drawing semi-circle $(x - 1)^2 + (y + 2)^2 = 16$. 4, 6
- (c) Find the pixels required for generating a line from (0, 0) to (10, 5) by Bresenham's algorithm. 6
4. (a) Describe an algorithm to fill the interior region of an arbitrary shaped object drawn on the screen. 10
- (b) Describe the depth buffer method for displaying the visual surfaces of a number of objects. 10
5. (a) A rectangle with vertices A (1, 1), B (7, 1), C (7, 5) and D (1, 5) is first scaled by a factor 3 in x and y directions about its centre. It is then rotated about this centre in clock-wise direction by an angle 45 degrees. Find the transformed coordinates of the rectangle. 10
- (b) A tetrahedron with vertices A (2, 4, 5), B (4, 2, 0), C (2, 6, 0), D (1, 3, 0) is rotated about y axis in anticlockwise direction to an angle 30° , and then is scaled in x and y direction to a factor 2. Find transformed coordinates of tetrahedron. 10
6. (a) Define window, viewport, user and screen coordinates. Derive window to viewport transformation matrix. 4, 6
- (b) What is Clipping ? Describe Cohen-Sutherland line clipping algorithm. Write its limitations. 10
7. (a) Write the properties of Bezier curve. A Bezier curve is drawn using the control points P_1 (1, 1), P_2 (2, 3), P_3 (4, 3) and P_4 (3, 1). Find the equation of Bezier curve and draw its rough sketch. 4, 6

- (b) Distinguish between parallel and perspective projections. Describe how a 3-dimensional object is presented on the 2-dimensional screen using different types of parallel projections ? 10

8. Write short notes on any *four* of the following : 5 each

- (a) Non-CRT display devices
- (b) Phong shading
- (c) Attributes of output primitives
- (d) Character generation
- (e) β -spline curves
- (f) Aliasing and Anti-aliasing

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MCA-403

M. C. A. (Fourth Semester) EXAMINATION, Dec., 2005

COMPUTER GRAPHICS

(MCA-403)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any five questions. All questions carry equal marks.

1. (a) What is DVST ? What are main differences between DVST and refresh CRT displays ? 3, 5
(b) Distinguish between Random scan system and Raster scan system. Discuss the implementation of Raster scan display. 4, 8
2. (a) What are interactive input devices ? Give their logical classification and describe with neat diagram the working of light pen. 2, 3, 5
(b) Describe an algorithm to fill the interior region of an arbitrary shaped object drawn on the screen. 10
3. (a) Write general Bresenham's line drawing algorithm and use it to find the points to be rasterized when line is drawn from $(-3, 3)$ to $(1, 2)$. 6, 4
(b) Write mid point circle generation algorithm and use it to find the pixels would be put ON for generating the

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arc of circle with centre origin and radius 6 from 0 degree to -45 degree. 5, 5

4. (a) Derive the transformation matrix which perform scaling of magnitude S_1 and S_2 in two arbitrary directions T_1 and T_2 perpendicular to each other and making angle 60 degree with co-ordinate axes. 10
- (b) Define window, viewport, user and screen co-ordinates. Derive window to viewport transformation matrix. 4, 6
5. (a) Suppose that a window has its lower left corner at $(-2, -1)$ and upper right corner at $(3, 2)$. Using Cohen-Sutherland line clipping algorithm, find the visible portion, if any, of the line segment joining the points $(-3, 1)$ and $(1, -2)$. 10
- (b) A tetrahedron with vertices A $(2, 4, 5)$, B $(4, 2, 0)$, C $(2, 6, 0)$, D $(1, 3, 0)$ is rotated about y-axis in anticlockwise direction by an angle 30° ; and then is scaled in x and y direction to a factor of 2. Find transformed location of tetrahedron. 10
6. (a) Distinguish between parallel and perspective projections. A rectangular field is described in 3-D co-ordinate system as follows :
 $J(-20, -20, 0)$, $K(20, -20, 0)$, $L(20, -20, -40)$,
 $K(-20, -20, -40)$.
 Where y-axis represents the vertical axis and z-axis is towards the viewer. A person is located at P $(0, 0, 20)$ and is looking at the field. Obtain the perspective view generated on XY-plane. 3, 7

- (b) Write the properties of Bezier curve. A Bezier curve passes through the points (1, 1) and (3, 1) and controlled by the points (2, 3) and (4, 3). Find the equation of Bezier curve and find mid point in it. Also draw its rough sketch. 3, 3, 2, 2
7. (a) Develop the specular reflection model for shading. Point out how the choice of power of cosine term is related to the surface property. 7, 2
- (b) Derive the A-buffer based hidden surface algorithm. 6
- (c) Discuss relative advantages and disadvantages of Gour and Shading and Phong shading. 5
8. Write short notes on any *four* of the following : 20
- (a) RGB monitors
- (b) B-spline curve
- (c) Five applications of Computer Graphics
- (d) Non-CRT display devices
- (e) Antialiasing methods
- (f) Homogeneous co-ordinate system

Total No. of Questions : 8] [Total No. of Printed Pages : 3

MCA-403

M. C. A. (Fourth Semester) EXAMINATION, Dec., 2004

COMPUTER GRAPHICS

(MCA-403)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any *five* questions. All parts of a question should be done in continuation. All questions carry equal marks.

1. (a) Describe any *five* useful applications of Computer Graphics. 6
- (b) Describe with neat diagram the working of calligraphic displays. 8
- (c) Describe the working of full colour frame buffer raster display system. 6
2. (a) What are interactive graphical input devices ? Give their logical classification and describe with neat diagram the working of one input device. 2, 3, 5
- (b) Write general Bresenham's line drawing algorithm and use it to find the points to be rasterised when line is drawn from $(-3, 3)$ to $(1, 2)$. 6, 4
3. (a) Develop mid point circle generation algorithm and write its steps. Use this algorithm to find the pixels

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which would be put ON for generating the arc of circle with centre origin and radius 6 units from 0 degree to - 45 degree. 5, 3, 4

- (b) Derive transformation matrix which perform scaling of magnitudes S_1 and S_2 in two arbitrary directions T_1 and T_2 perpendicular to each other and making angle α (alpha) with coordinate axes. 8
4. (a) Vertices of a triangle are located at P (80, 50) Q (60, 10) and R (100, 10). It is desired to obtain its mirror reflection about the line $y = x + 2$. Work out the necessary transformation matrix to achieve it and also find the position of image triangle. 6, 2
- (b) What is the need of normalised device coordinates ? Find normalised transformation that maps a window defined by the vertices A (1, 1), B (5, 3), C (4, 5) and D (0, 3) onto a viewport that is the entire normalised device system. 2, 6
- (c) Explain why Sutherland-Hodgman polygon clipping algorithm works for only convex clipping region. 4
5. (a) Suppose that a window has its lower left corner at (- 2, - 1) and the upper right corner at (3, 2). Using Cohen-Sutherland line clipping algorithm, find the visible portion, if any of the line segment joining the points (- 3, 1) and (1, - 2). 10
- (b) Given a unit cube with one corner at (0, 0, 0) and opposite corner at (1, 1, 1). Derive the transformation necessary to rotate the cube by 45 degree about main diagonal (from (0, 0, 0) to (1, 1, 1)) in counter clockwise direction when looking along the diagonal towards origin. 10

6. (a) What is the role of Bezier curve in designing curves and surfaces ? Discuss its properties. Write advantages and disadvantages of Bezier curve over B-spline curves. 2, 3, 5
- (b) Distinguish between parallel and perspective projections. A rectangular field is described in 3-D coordinate system as follows :
 $A (-20, -20, 0)$, $B (20, -20, 0)$, $C (20, -20, -40)$,
 $D (-20, -20, -40)$
 where Y-axis represents the vertical axis and Z-axis is towards the viewer. A person is located at $P (0, 0, 20)$ and is looking at the field. Obtain the prospective view generated on XY-plane. 3, 7
7. (a) Develop the specular reflection model for shading. Point out how the choice of power of cosine term is related to the surface property ? 7, 3
- (b) Describe A-buffer based hidden surface algorithm. 6
- (c) Given points $A (1, 2, 0)$, $B (3, 6, 20)$ and $C (2, 4, 6)$ and a view point $D (0, 0, -10)$. Find which points obscure the other when viewed from C ? 4
8. Write short notes on any *four* of the following : 5 each
- Gouraud shading
 - Character generation
 - Area filling
 - Attributes of output primitives
 - Methods of antialiasing
 - Plotters