(Please write your Exam Roll No.) *Exam Roll No.* 00372402014

END TERM EXAMINATION

FIFTH SEMESTER [BCA] DECEMBER-2014

Paper Code: BCA303 ***Subject: Computer Graphics (Batch: 2011 onwards)***

Time : 3 Hours ***Maximum Marks :75***

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit.

Q1 Write short notes on the following:- **(2.5x10=25)**

(a) Touch Panel Screen
(b) Antialiasing
(c) Significance of 4 bit code in line clipping.
(d) Homogeneous coordinate system
(e) Matrix representation of 2-D shearing.
(f) Primitive Instancing
(g) Projections
(h) Vanishing point
(i) Object Space method
(j) Frame buffer

UNIT-I

Q2 (a) Describe Mid-Point line drawing algorithm with it's complete derivation. **(6.5)**

(b) Scan convert the straight line using Midpoint line algorithm whose end points are (0,0) and (5,6). **(6)**

OR

Q3 (a) Distinguish between following:- **(3x2=6)**

(i) Interactive vs. Non Interactive graphics.
(ii) Raster vs. Random Scan display.

(b) Discuss Cohen-Sutherland line clipping algorithm with a suitable example. **(6.5)**

UNIT-II

Q4 (a) What do you understand by window port and view port? Briefly describe the steps to transform an object from window port to view port view conversion. **(6.5)**

(b) Consider a square A(1,0) B(0,0) C(0,1) D(1,1). Rotate the square ABCD by 60^0 clockwise about the point A(1,0). Also draw the transformed square. **(6)**

OR

Q5 (a) Prove that two successive 2-D rotations are additive in nature i.e $R(\alpha)R(\beta) = R(\alpha + \beta)$. **(6)**

(b) Reflect a diamond shaped polygon whose vertices are A(-1,0), B(0,-2), C(1,0) and D(0,2) about (i) the horizontal line y=2 (ii) the vertical line x=2. **(6.5)**

UNIT-III

Q6 (a) Explain that how solids are represented by using Boundary representation (B-rep) Technique and Constructive Solid Geometry (CSG) Technique? **(6.5)**

(b) Describe Polygon Meshes. **(6)**

OR

Q7 (a) State the properties of Bezier curve. For the cubic Bazier Curve (n=3), find all the blending functions and the Bezier matrix. **(9.5)**

(b) What do you mean by B-Spline curves? Identify the difference between Bezier and B-spline curve. **(3)**

UNIT-IV

Q8 (a) How parallel projections are different from perspective projections? Explain by discussing suitable example. **(6)**

(b) Perform a perspective projection onto the x=0 plane of the unit cube where centre of projection is at x_c=-10, y_c=-10 and z_c=-10. **(6.5)**

OR

Q9 (a) What is Hidden Surface Removal Method? Why do we need to remove hidden surface? Discuss the Depth Buffer (Z buffer) algorithm for hidden surface removal. **(6.5)**

(b) Distinguish between the following:- **(3x2=6)**

(i) Cavalier vs. Cabinet projections (ii) 2-D clipping vs. 3-D clipping

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END TERM EXAMINATION

FIFTH SEMESTER [BCA] DECEMBER 2015

Paper Code: BCA303	*Subject: Computer Graphics (Batch 2011 onwards)*
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 Explain **any five** of the following:- **(5x5=25)**

(a) Role of Video Controller in Raster Display systems
(b) Conceptual framework for Interactive Graphics
(c) Matrix representation of 3D Scaling
(d) Transformation as a change in Coordinate System
(e) Polygon Mesh
(f) Octree

UNIT-I

Q2 (a) What do you mean by scan conversion? Derive the equations for scan converting a line using Bresenham's line drawing algorithm. **(7.5)**

(b) Differentiate between Random scan and Raster scan. Explain random scan display processor with suitable diagram. **(5)**

Q3 (a) What is clipping? Explain Cohen - Sutherland line clipping algorithm. **(7.5)**

(b) Let R be the rectangular window whose lower left hand corner is at L(-3, 1) and upper right hand corner is at (2,6). Find the endpoint codes for the following points according to Cohen Sutherland algorithm of line clipping.
A(-4,2), B(-1,7)
C(-1,5), D(3,8)
E(-2,3), F(1,2)
G(1,-2), H(3,3)
I(-4,7), J(-2,10) **(5)**

UNIT-II

Q4 (a) Find the general form of the transformation N which maps a rectangular window with x extent wx_{min} to wx_{max} in x direction and y extent wy_{min} to wy_{max} in y direction on to a rectangular viewport with x extent vx_{min} to vx_{max} and y extent vy_{min} to vy_{max}. **(7.5)**

(b) Explain the transformation matrixes for various 2 D transformation in homogenous coordinates. **(5)**

Q5 (a) Find the complete viewing transformation that maps a widow in a world coordinates with x extent 1 to 10 and y extent 1 to 10 on to a viewport with x – extent ¼ to ¾ and y extent 0 to ½ in normalized device space, and then maps a window with x extent ¼ to ½ and y extent ¼ to ½ in the normalized device space in to a viewport with x extent 1 to 10 and y extent 1 to 10 on the physical display device. **(7.5)**

(b) Find the normalization transformation N which uses the rectangle A(1,1), B(5,3), C(4,5), D(0,3) as a window and the normalized device screen as a viewport. **(5)**

UNIT-III

Q6 (a) Define parametric Bicubic surface? Discuss Hermite surface in detail. **(7.5)**

(b) State and prove a property of a Bezier Curve with four control points. **(5)**

Q7 (a) Explain how Bezier curves are represented parametrically. Consider a Bezier Curve having control points $P_1(20,0)$, $P_2(0,20)$, $P_3(80,40)$, $P_4(40,0)$. Compute the coordinates of the points on the curve for t = 0.0, 0.2, 0.6, 1.0. **(7.5)**

(b) What is CSG? Discus various user interfaces for solid modeling. **(5)**

UNIT-IV

Q8 (a) What do you mean by Hidden Surface? Discuss z – buffer method for removal of hidden surface. **(7.5)**

(b) Define Projection? Differentiate between parallel and perspective projection with suitable examples. **(5)**

Q9 (a) "Hidden surface should be removed" why? Discuss painter's algorithm for hidden surface removal. **(7.5)**

(b) Define Orthographic Projection. Discuss different applications of parallel and perspective projections. **(5)**

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END TERM EXAMINATION

FIFTH SEMESTER [BCA] DECEMBER 2016

Paper Code: BCA-303	***Subject: Computer Graphics***
Time: 3 Hours	***Maximum Marks: 75***

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit.

Q1 Answer the following questions: **(2.5x10=25)**

(a) What is the function of a CRT?
(b) Give two differences between random scan and raster scan display system.
(c) Define the terms Bit map, pixel map and resolution.
(d) What is interlacing?
(e) Specify first order parametric continuity condition for two curves?
(f) Give a chart classifying the various projections.
(g) List various input devices used in interactive graphics.
(h) Consider a raster system with resolution of 1280 x 1024. What sizes of frame buffer (in bytes) are needed for the system to store 24 bits per pixel and 12 bits per pixel respectively?
(i) What is an Octree?
(j) Mention two advantages of LCD displays over Plasma displays.

Unit-I

Q2 (a) Describe Bresenham's circle drawing algorithm. Draw a quadrant of a circle of radius 6 with center (1, 3) giving all steps. **(7.5)**

(b) Using Bresenham's line drawing algorithm find out the list of the activated pixels for the line from (5, 5) to (13, 9). **(5)**

Q3 (a) Given a clipping window A(20, 20), B (60, 20), C(60, 40), D(20, 40). Using Sutherland Cohen algorithm find the visible portion of the line segment joining the points P(40, 80) and Q(120, 30). **(6)**

(b) Discuss the advantages of interactive graphics? Give a classification of applications where interactive graphics are used. **(6.5)**

Unit-II

Q4 What is the significance of homogenous coordinate system in graphic? Give 3D transformation matrices for rotation in homogeneous coordinate system. Magnify the triangle with vertices A(0, 0), B(1, 1), C(5, 2) to twice its size keeping C(5, 2) fixed. **(12.5)**

Q5 (a) A triangle is defined by vertices A(2,2), B(4,2), C(4,4). Find the transformed coordinates of the triangle after rotation about origin through 90^0 followed by reflection about the line $y = -x$. **(6)**

(b) Discuss steps and give matrix to transform an object from window to viewport. **(6.5)**

Unit-III

Q6 Give the properties of Bezier curve. Find all the blending functions and drive Bezier matrix for a cubic Bezier curve. Hence find the equation of a Bezier curve given the control points as $P_0(40,40)$, $P_1(10,40)$, $P_2(10,60)$, $P_3(60,0)$ and draw a rough sketch of the curve. **(12.5)**

Q7 (a) What are B spline curves? Describe the various types of B splines. **(6)**

(b) What are spatial partitioning representation and boundary representations? **(6.5)**

Unit-IV

Q8 (a) Discuss the various types of parallel projections. **(7.5)**

(b) Find the projection of a unit cube using Cabinet projection with $\theta = 30^0$. **(5)**

Q9 (a) Explain Z-Buffer Method for hidden surface removal with an example. **(6.5)**

(b) Explain Cohen Sutherland clipping algorithm for 3D clipping. **(6)**

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END TERM EXAMINATION

FIFTH SEMESTER [BCA] NOVEMBER-DECEMBER 2017

Paper Code: BCA-303	***Subject: Computer Graphics***
Time: 3 Hours	***Maximum Marks: 75***

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit.

Q1 Answer **any ten** questions of the following: **(2.5x10=25)**

(a) Draw the architecture of a simple raster graphics system?
(b) Give three differences between parallel and perspective projections.
(c) Define the terms persistence and aspect ratio.
(d) List three properties of B spline curve?
(e) How much time is spent scanning across each row of pixels during screen refresh on a raster system with resolution of 1280x1024 and a refresh rate of 60 frames per second?
(f) What is significance of homogeneous coordinate system in graphics?
(g) List advantages and disadvantages of DDA algorithm for line drawing.
(h) Consider a raster system with resolution of 1280x1024. How many pixels could be accessed per second in the system by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel?
(i) What is Anti-Aliasing?
(j) Give the transformation matrices for 3D rotation.
(k) List three properties of a B-Spline curve.

Unit-I

Q2 (a) Derive condition for scan converting a circle using Bresenham's circle drawing algorithm. Draw an octant of a circle of radius 8 and centered at origin giving all steps. **(7.5)**

(b) List and explain the applications of interactive computer graphics. **(5)**

Q3 (a) Given a clipping window A(20, 20) B(60, 20) C(60, 40) D(20, 40). Using Cohen Sutherland algorithm find the visible portion of line segment joining the point P(40, 80) Q(120, 30)? **(6.5)**

(b) Discuss about midpoint subdivision algorithm. **(6)**

Unit-II

Q4 (a) Consider the square (0,0), (0,2), (2,0), (2,2). Perform a composite transformation of the square by using the following steps. (Give the coordinates of the square at each of the intermediate steps).

(i) Scale by using $S_x = 2$ and $S_y = 3$.
(ii) Rotate 45^0 in the anticlockwise direction.
(iii) Translate by using $T_x = 3$ and $T_y = 5$. **(6.5)**

(b) Derive the transformation matrix for reflection of a point about an arbitrary line y = mx+c. **(6)**

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END TERM EXAMINATION

FIFTH SEMESTER [BCA] NOVEMBER-DECEMBER 2018

Paper Code: BCA-303 **Subject: Computer Graphics**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions:- **(2.5x10=25)**

(a) Explain eight-way symmetry of circle.
(b) What is anti-aliasing?
(c) What is the role of video controller in raster scan system?
(d) What are the coordinates of the point P (2, -4) after rotating by 30° about the origin?
(e) Explain the working of color CRT.
(f) Define Homogeneous coordinate system.
(g) Differentiate between Orthographic and Oblique projection.
(h) Briefly explain the concept of Polygon meshes.
(i) What is primitive instancing?
(j) Differentiate between 2D clipping and 3D clipping.

UNIT-I

Q2 (a) Describe Bresenham's line drawing algorithm with its derivation. **(6.5)**
(b) Using Mid-Point circle algorithm draw a quadrant of circle of radius 7 with center (0, 0). **(6)**

Q3 (a) Let R be rectangular window whose lower left-hand corner is at L(-3,1) and upper-right hand corner is at R(2,6). Clip line segment AB with endpoints A(-4,2) and B(-1,7) using Cohn-sutherland algorithm. **(6.5)**
(b) Explain conceptual framework for interactive graphics. **(6)**

UNIT-II

Q4 (a) Perform a 45° rotation of triangle A(0,0), B(1,1), C(5,2) about P(-1,1). **(6.5)**
(b) Explain window-to-viewport transformation. **(6)**

Q5 (a) Prove that two successive 2D scaling are multiplicative in nature, i.e, **(7.5)**

$$S(S_{x1}, S_{y1})\,S(S_{x2}, S_{y2}) = S(S_{x1}, S_{x2}, S_{y1}, S_{y2})$$

(b) Explain matrix representation of 3D transformations. **(5)**

UNIT-III

Q6 Explain the following:- **(12.5)**
(a) Boundary representation
(b) Spatial partitioning
(c) CSG
(d) Sweep representation

Q7 (a) State the properties of Beizer curves. Find all blending function, for Beizer curve (n=3). **(6.5)**
(b) Describe B-Spline in detail and identify the differences between b-spline and Beizer curve. **(6)**

UNIT-IV

Q8 (a) What do you understand by hidden surface removal. Explain Painter's algorithm. **(6.5)**
(b) Explain various types of parallel projection. **(6)**

Q9 (a) Explain various types of perspective projections. **(6.5)**
(b) Explain Z-buffer method for hidden surface removal. **(6)**

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END TERM EXAMINATION

FIFTH SEMESTER [BCA] JANUARY-FEBRUARY 2023

Paper Code: BCA-303 **Subject: Computer Graphics**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit.

Q1 **Answer the following questions:-** **(2.5x10=25)**

(a) Differentiate Quadtrees and Octrees.
(b) Differentiate U and U* operators.
(c) Consider a Raster scan system with the resolution of 1280 by 1024. What size of frame buffer is needed (in Kilo Bytes) if 12 bits per pixel are to be stored?
(d) What do you mean by scan conversion? Give examples of algorithms used for scan conversion of a circle.
(e) What is antialiasing? What are various techniques for antialiasing?
(f) What is the need of Hidden surface removal algorithms?
(g) What are various anomalies associated with Perspective projection?
(h) Differentiate interpolation and approximation methods for spline representation.
(i) What are various desirable properties for a solid representation?
(j) What do you mean by the statement" Translation and Rotation are rigid body transformations"?

UNIT-I

Q2 (a) Discuss Bresenham's approach for scan converting a line. **(6)**
(b) Compute the intermediate points from (0,0) to (5,10) on a line using Bresenham's approach. **(6.5)**

Q3 (a) Discuss Midpoint subdivision line clipping algorithm with example. **(6)**
(b) Discuss Conceptual Framework for interactive graphics. **(6.5)**

UNIT-II

Q4 (a) Discuss various basic 2D transformations in detail with their matrices. **(6)**
(b) What is the need of representing transformations as Homogeneous coordinates? List various basic transformation matrices after conversion to Homogeneous coordinates? **(6.5)**

Q5 (a) Discuss Window to Viewport transformation in detail. **(6)**
(b) Reflect the triangular polygon whose vertices are A(-1,0), B(0,-2) and C(1,0) about the line Y = X + 2. **(6.5)**

UNIT-III

Q6 (a) What are various methods for Polygon Mesh representation? **(6)**
(b) What do you mean by Blending function? Prove that the blending function of open uniform B Spline is equal to that of Bezier curve for d = n+1 (where n is number of control points and d is degree). **(6.5)**

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BCA-303
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Q7 (a) Draw a Beizer curve with respect to control points p(1,3),q(2,4),r(5,5),s(7,3) and draw it's Covex hull. **(6)**

(b) Discuss and differentiate various parametric and geometric continuity conditions in detail. **(6.5)**

UNIT-IV

Q8 (a) Discuss and differentiate Object space and Image space methods for hidden surface removal with examples. **(6)**

(b) Discuss various types of Orthographic projections. **(6.5)**

Q9 (a) Explain Depth Sorting method of Hidden surface removal in detail. **(6)**

(b) Discuss three dimensional Cohen Sutherland Clipping in detail. **(6.5)**

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