Code No: V3125 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, May 2013

COMPUTER GRAPHICS

(Common to Computer Science and Engineering, Information Technology and Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) How does computer graphics help in engineering design, fashion design, textile design and advertising?
   (b) Compare DVST and refresh display. List the properties of phosphor used in CRT monitors.

2. (a) Using Bresenham's line-drawing algorithm, digitize the line with end points (20, 10) and (30, 18).
   (b) How do we represent polygon using polygon table, edge table and vertex table explain with an example.

3. (a) Explain the steps involved in rotating an object about an axis that is not parallel to x-axis. Draw appropriate diagrams.
   (b) Consider a rectangle A(30, 10), B(60, 10), C(60, 30), D(30, 30). Work out a transformation to rotate the rectangle about point B by 60^o anti clockwise. What will be the new coordinate of point D?

4. (a) Distinguish between window port and viewport. In 2D clipping how are lines grouped into visible, invisible and partially visible categories?
   (b) Which clipping algorithm is best suited for hardware implementation? Give how this algorithm works.

5. (a) Explain how a 3D object is represented with an example.
   (b) Given control points (10,100), (50,100), (70,120) and (100,150). Calculate coordinates of any four points lying on the corresponding Beizer curve.

6. (a) A cube is placed at the origin of 3D system. Such that all its vertices have positive coordinate values and sides are parallel to the three principal axes. Indicate a convenient position of a viewer at which he can see a 2-point perspective projection. Verify that such a view is generated.
   (b) Define vanishing points. Is the location of vanishing point directly related to the viewing point? Explain how?

7. (a) What is ray tracing algorithm for hidden surface removal? Explain mathematically how do we find which planes are visible using ray tracing algorithm.
   (b) Compare and contrast depth buffer method with depth sorting method.

8. (a) Write a short note on polygon rendering methods.
   (b) What are key-frame systems? Explain the concept of morphing.

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Code No: V3125 **R07** **Set No: 2**

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Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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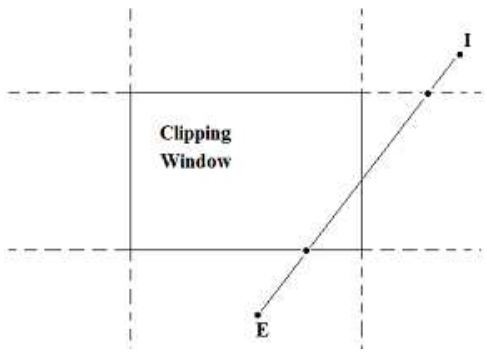
1. (a) Describe the role of animation in entertainment and scientific visualization.
   (b) What is refresh buffer? Identify the contents and organization of the refresh buffer for the case of raster display and vector display?

2. (a) Find the pixel location approximating the first octant of a circle having a centre (2, 3) and a radius of 2 units using Bresenham circle algorithm. Use this to plot the complete circle on a Cartesian graph representing pixel grids.
   (b) Explain boundary fill algorithm with example.

3. (a) What is the combined effect of rotation through 90^o followed by reflecting along the line y = - x on the line segment joining (2, 2) and (4, 4)?
   (b) Investigate the effect of the transformations T1 and T2 on a triangle having co-ordinates A(2, 2), B(4, 2) and C(4, 4), where T1 denotes rotation through 90^o in the counter clockwise direction and T2 denotes a reflection with respect to the line y = -x. Do we obtain the same result when the two transformations are applied in the reverse order?

4. (a) Use Cohen-Sutherland line clipping algorithm to clip the line EI given below.



   (b) Explain how to Map a window to view port?

5. (a) Derive simple illumination model. Include the contribution of Diffuse, ambient and specular reflection.
   (b) How are periodic B-spline curves different from non-periodic B-spline curves?

6. (a) What do you understand by vanishing points for perspective projections? Clearly explain with the help of diagrams the concept of one-point and two-point perspective projection.
   (b) Write notes on clipping of a 3D object with an example.

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7. (a) What are the two spaces in which hidden surface algorithms work? How does sorting and coherence speed up calculation in such algorithms?
   (b) Explain BSP tree method with suitable example.

8. (a) An animation sequence is to be developed to show a car accelerating from stationary position and then moving with constant speed. Show how the accelerations can be simulated for this purpose?
   (b) Write notes raster animation.

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Code No: V3125 **R07** **Set No: 3**

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COMPUTER GRAPHICS

(Common to Computer Science and Engineering, Information Technology and Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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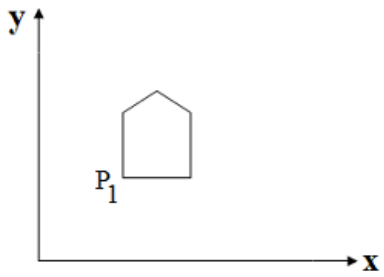
1. (a)Find the number of colours a frame buffer of 8 bit planes each of red, green and blue, and 10 bit wide lookup table can produce.
   (b) How are different shades of colour generated on the RGB monitors?

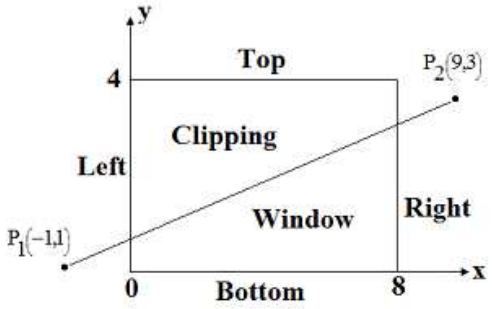
2. (a) Explain the steps in midpoint circle drawing algorithm.
   (b) Fill the closed polygon with the vertices (5, 6), (5, 12), (14, 12), (14, 6). Use scan line seed fill algorithm with (9, 9) as seed. Fill only two scan lines.

3. (a) Obtain the matrix that represents two dimensional translation by factors l_x and l_y along x and y axis respectively.
   (b) The following figure represents a house in the xy-plane.



   The house is to be rotated about the point P1 through an angle θ in the counter clockwise direction. Write the sequence of three fundamental transformations required to do this. Obtain the corresponding composite matrix and illustrate each step through pictures.

4. (a) Clip the line PP shown in the figure below using Cyrus-Beck clipping algorithm.



   (b) Explain Sutherland Hodgeman polygon clipping algorithm. Explain the disadvantages of it and how to rectify this disadvantages.

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5. (a) What are quadric surfaces? Write the equation of a sphere in Cartesian and spherical coordinates (r, θ, Φ).
   (b) Write a short note on Hermite splines.
   (c) Explain the Gouraud surface rendering method.

6. (a) Write a short note on orthogonal projection of an object. Illustrate your answer with the help of appropriate diagrams.
   (b) Explain the following 3D transformations with example.
   i) scaling ii)rotation iii)translation

7. (a) Explain the Back-Face detection method for locating the back faces of a polyhedron. Illustrate with the help of suitable diagrams.
   (b) Write notes on octree methods.

8. (a) Describe briefly how can we simulate zero acceleration, positive acceleration and deceleration between two key frames in an animation.
   (b) Write notes on morphing.

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Code No: V3125 **R07** **Set No: 4**

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Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Find the refresh rate of a 512 x 512 frame buffer, if the access time for each pixel is 200 nanoseconds (ns).
   (b) Explain the architecture of raster display.

2. (a) Describe briefly Bresenham's circle drawing algorithm. Why do we prefer incremental algorithm over DDA?
   (b) Explain flood fill algorithm with example.

3. (a) Give a 3x3 homogeneous matrix to rotate the image clockwise by 90^o. Then shift the image to the right by 10 units. Finally scale the image by twice as large. All these transformations are to be done one after another in sequence.
   (b) Write the matrix of rotation of a point through an angle of 45^o in the counter clockwise direction. Investigate its effect on the line joining A(2, 3) and B(7, 11).

4. (a) Consider a clipping window A(0,0), B(30,0), C(30,20), D(0,20). Using the outcodes of the end points of the line X(–10,30) – Y(35,8), show that the line is partially visible.
   (b) What is the difference between window and viewport? Explain with example.

5. (a) Find the equation of the Bezier curve which passes through (0, 0) and (-4, 2) and controlled through (14, 10) and (4, 0).
   (b) Write a short note on B-spline curves.

6. (a) What is meant by 3D composite transformation? Explain with suitable example.
   (b) Write notes on 3D viewing with appropriate diagrams.

7. (a) Describe the scan-line method for identifying visible surfaces of a polyhedron.
   (b) Explain the Gouraud surface rendering method.

8. (a) State the components of the traditional animation.
   (b) Explain a method of simulating acceleration at the beginning followed by de-acceleration at the end between two given key frames in an animation clip.
   (c) Write notes on computer animation languages.

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