Name: Roll No:

Computer Graphics (CSE 8401)

Mid Semester Examination-II

Department of Computer Science & Engineering,
University Institute of Engineering & Technology,
C. S. J. M. University, Kanpur

Max Marks: 30 **Max Time: 90 Mins.**

Note:

1. Answer all subparts of a question at same place.
2. Start each new question from a fresh page.

SECTION A
(1 *Mark Each*)

1. What is *Homogeneous Coordinate* System?
2. Define *Transformation* in terms of Computer Graphics.
3. What is use of *Graphic Card* in Computer?
4. Write down name 3 *Geometric Transformations*.
5. What is full form of *DDA* in line drawing algorithm?
6. Prove that $R(\theta_1)\ R(\theta_2) = R(\theta_1 + \theta_2)$ using transformation metrics.
7. What is advantage of *Bresenham's Line Drawing Algorithm* over *DDA algorithm*?
8. Write down 3x3 *Identity transformation metrics* and what is its effect on a general point $P(x,y)$?
9. Write down metrics for *reflection about x axis* in homogeneous coordinate system.

SECTION B
(3 *Mark Each*)

10. Write down the algorithm to draw a complete circle of radius r about origin.
11. Represent reflection about line $y=x$ in terms of rotation.
12. Write down the new equation of a line (with end points $P_1(2,5)$ and $P_2(10,30)$) if we reflect it about line $x = 10$.

SECTION C
(6 Mark *Each*)

13. Using the Mid-Point method, and taking the symmetry into account, develop an efficient algorithm for scan conversion of the following curve over the interval $-10 \le x \le 10$.

$$y = \frac{1}{10}x^2$$

14. Apply the *Bresenham's algorithm* to turn up pixels along the line segment determined by points $P_1(5,7)$ and $P_2(12,11)$.

(8)

Computer Graphics (CSE S401)

Mid Semester Examination – I

Department of Computer Science & Engineering,
University Institute of Engineering & Technology,
C. S. J. M. University, Kanpur

Max Marks: 30 **Max Time: 90 Mins.**

Note:

1. Answer all subparts of a Section at same place.
2. Start each section from a fresh page.

SECTION A
(1 *Mark Each*)

1. List some applications of large screen display.
2. Define PIXEL.
3. What is use of DMA in computer graphics?
4. Write down name of three *output* devices.
5. What is full form of CT scan?
6. Write down name of 3 *Graphic based input* devices.
7. Write down the name of function used to draw a point in C language.
8. What is *palette* in computer graphics?
9. List 2 major challenges in any line drawing algorithm.

SECTION B
(3 *Mark Each*)

10. What is difference between *Raster Scan System* and *Vector Scan System*?

11. Explain the working principal of Graphic Card. How it is used to display images?

12. Write pseudocode to draw shape shown in *Figure 1* considering that you have following functions:
draw_circle(radius,centre_x,centre_y) //draws a circle of radius *r* centered at *centre_x, centre_y*
draw_line(x1,y1,x2,y2) //draws a line between points *(x1,y1)* and *(x2, y2)*

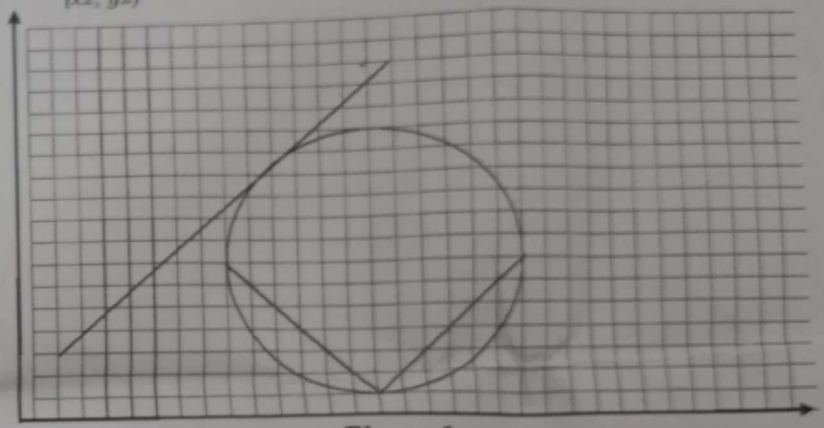

Figure 1

SECTION C
(6 Mark *Each*)

13. A raster system with a resolution of *1024* x *1024* is given. What is the size required (in bytes) to store *4 bits/pixel*? How much storage is required if *8 bits/pixel* are to be solved?
14. Explain in details the DDA line drawing algorithm.

Computer Graphics (CSE- S401)

END SEMESTER EXAMINATION

Department of Computer Science & Engineering
University Institute of Engineering & Technology
C. S. J. M. University Kanpur

Max Marks: 50 **Max Time: 180 Mins.**

Note:

1. Answer all subparts of a section at same place.
2. Start each new question from a fresh page.

Section A
(2 marks each)

1. What is difference between a *window* and a *viewport*?
2. Differentiate between the terms *Raster Scan* and *Vector Scan*.
3. What is use of *homogeneous coordinate* system in 3D transformation?
4. Differentiate between the term *pixel* and *voxel*.
5. A screen has *2048* screen lines with aspect ratio of *4:3* and bit depth *32*, how many bits per pixel are required to show *60* frames per second?

Section B
(5 marks each)

1. Explain *Cohen-Sutherland* algorithm for line clipping.
2. Write a 3x3 homogeneous matrix to scale an image to be twice as large and then rotate clockwise by 45 degrees about the point (5,5).

Section C
(6 marks each)

1. Show that the composition of two successive rotations in 3D are additive i.e. $R(\theta_1).R(\theta_2) = R(\theta_1+\theta_2)$ only when rotated about same axis.
2. Derive mid-*point algorithm* for *ellipse* drawing.
3. A general point $P(x,y,z)$ in 3D is rotated by an angle of 90° about a plane whose orthogonal vector passes through points $P_1(x_1,y_1,z_1)$ and $P_2(x_2,y_2,z_2)$ and P_r is lying on the said plane. What will be the new coordinates of this given general point P after this reflection?
4. In 2D, it is possible to rotate data without using a rotation matrix, by instead using a sequence of a shear in x, followed by a shear in y, and then a non-uniform scaling. Using the method of shear x / shear y / scale to accomplish rotations, answer the following questions.
   As a reminder, here are the shear matrices:

$$\text{Shear}(Y)=\begin{bmatrix} 1 & 0 & 0 \\ Sh_y & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \text{Shear}(X)=\begin{bmatrix} 1 & Sh_x & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

   a. To rotate by θ, what should the X scaling term be?
   b. To rotate by θ, what is the relationship between the X and Y shear factors?
   c. To rotate by θ, what is the X shear factor?
5. Given a line which passes through points $P_1(1,1,1)$ and $P_2(10,10,10)$. A general point $G(x,y,z)$ is rotated about this line by an angle θ. Find out the value of new point G` after the rotation of G if
   a. $G = (3,3,3)$ and $\theta = 30$
   b. $G = (2,5,2)$ and $\theta = 45$