Course Title : Computer Graphics (CS C471/ IS C471)

Component	: Test I (Regular) (CB)	Max. Marks : 30 marks (15%)
Duration	: 1 hour	Date : 22-02-2012 (12.00 to 1.00pm)

1. Answer to the following questions: [1+1+3+2= 7 Marks]

   a. Consider the point (2,5) in the XY plane. Assume that the point is rotated counter-clockwise in the plane by 90 degrees about the origin. What are the coordinates of the resulting point?

   b. What is the homogeneous matrix for a translation by (10, 20)?

   c. If you rotate the point (20,30) by 90 degrees anticlockwise and then translate it by (-20,0) and then scale it by (2,1), where will the point be?

   d. Assume that a certain full-colour (24 bit per pixel) RGB raster system has a 2048 by 2048 frame buffer. How many distinct colour choices would be available? How much memory is required to store the pixmap? Express your answer in Mbytes.

2. Explain the following with suitable examples: [2+2=4 Marks]

   a. Antialiasing   b. Edge coherence

3. Use Sutherland Hodgeman algorithm to clip the given polygon against window which is shown as dotted lines. Clipping is applied in the following order: Left clipper → right clipper→bottom clipper → top clipper. Fill in the following table for each clipper and draw the final clipped polygon. Note the following : Process the edges in the increasing order of the vertices. For naming the intersecting vertices use the following convention: if the starting edge is v1 and ending edge is v2, intersecting at left edge of the window then new vertex is named as v11.
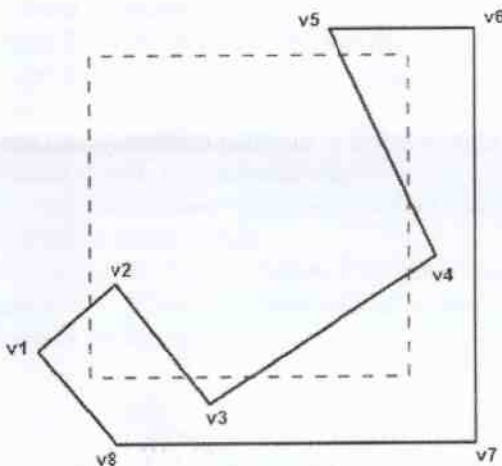
Input edges	Output edges

[6 Marks]

4. Find out the raster locations by using Mid point line algorithm for the end points of a straight line (20,10), (30, 18).   [1+4 Marks]

   a. What is the initial decision parameter?

   b. Fill in the following table:

Iteration No.	Decision Parameter	Pixel placed(x,y)
1		
2		
:		

5. The following set of vertices describes the polygon: p1(1,1)→p2(3,1)→p3(3,4)→ p4(5,1)→p5(5,6)→p6(3,6)→ p7(3,8)→p8(1,6)→p1(1,1).   [6+2 Marks]

   a. What pixels are filled by the scanline fill algorithm on lines y = 3, y = 4 and y = 6. Show all the relevant data structures.

   b. Explain in detail, how you derived your answer for y =3.

Course Title : Computer Graphics   **(CS C471/ IS C471)**

Component   : Comprehensive (Regular) (CB)   Max. Marks   : 60 marks (30%)

Duration   : 3 hours   Date : 2-5-2012 (9.00 to 12.00 noon)

Part A (Marks :40, Duration : 120 min)

1. (a) State whether the following statements are True or False. Incorrect answer will fetch -1 marks.   **(5Marks)**

    i.   Representing transformations in homogeneous form allows for combined transformations using a single matrix.

    ii.   In parallel projection, the size of objects in the image changes only as a function of the distance from the viewer.

    iii.   The amount of ambient light incident on each object is a constant for all surfaces and over all directions.

    iv.   Rotate – translate pair is commutative in three dimensions

    v.   Ambient light is described as the shiny highlights on objects

    (b) Explain the working of Random scan displays.   **(5 Marks)**

2. Answer these questions: **(10 Marks)**

    a) What is CIE Chromaticity diagram? Explain with neat diagram, how CIE Chromaticity diagram can be used in i) Comparing color gamuts for different sets of primaries ii) Determining dominant wavelength   (4)

    b) Define halftoning and halftones.   (1)

    c) With reference to solid modeling, define the following:
       i) Complete geometric representation ii) Valid geometric representation   (2)

    d) Draw B-rep data structure for the following object (Fig 1) where f1 to f5 represents faces, E1 to E8 represents edges and V1 to V8 represents vertices.   (3)

3. Answer these questions: **(10 Marks)**

    a) Giving Reasons, describe whether the following statement is true or false. "Bresenham's algorithm uses integer rather than floating point values because integer values require less storage space than floating point values."   (2)

    b) Write transformation matrices to achieve each of the following 3D transformations   (3)
       (i) Scale x by 3, y by 0.5 and z by 1
       (ii) Undo a translation that has moved an object by 6 units up with respect to the y axis.
       (iii) Reflect on the z-axis.

    c) Refer to the Fig. 2 given below. The intensities at the given points A, B and C are 180, 60 and 140 respectively. What is the interpolated intensity at the point (200,150) which falls on the scan line $y=150$ as shown in the figure?   (3)
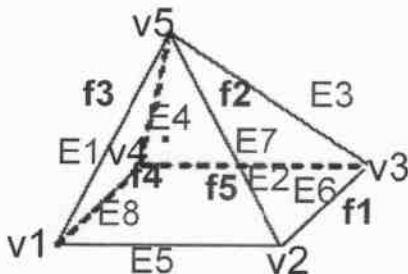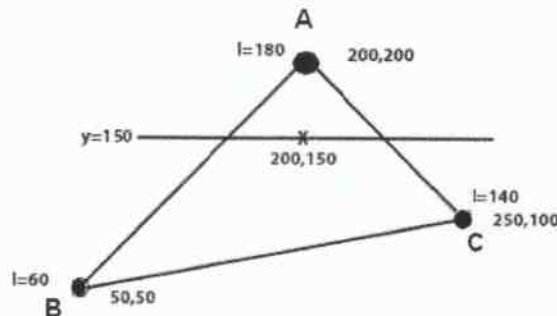

Fig. 1. Question No 2(d)   Fig. 2. Question No. 3(c)

    d) Differentiate between "windows" and "viewports" in computer graphics system.   (2)

4. Answer these questions: **(10 Marks)**

    a) Before we can begin drawing with a z-buffer algorithm, we need to initialize the values in the z-buffer. Why? What would be a reasonable value for initializing the z-buffer?   (2)

    b) Consider two computer graphic systems which uses Z-buffer technique to eliminate hidden surface. System A uses 8 bits per pixel whereas System B uses 16 bits per pixel in Z-buffer. Which one is better and why?   (2)

    c) Explain with a neat diagram, Warnock algorithm.

    d) Describe the difference between Gouraud shading and Phong shading.   (2)

Course Title : Computer Graphics		**(CS C471/ IS C471)**
Component	: Comprehensive (Regular) (CB)	**Max. Marks : 60 marks (30%)**
Duration	: 3 hours	**Date : 2-5-2012 (9.00 to 12.00 noon)**

Part B (Marks :20, Duration : 60 min)

Implement following changes in the code written for "swing with doll"

    (a) Seat should be oval shape and its color should be red.   (4 Marks)

    (b) Alternate chain links should be colored with yellow and black color. ((4 Marks)

    (c) While swinging in forward direction doll should stretch its legs and while in reverse direction dolls' legs should fold. (6Marks)

    (d) Blue spot light should fall on the doll when swing reaches the maximum height in forward direction.

                                             (6 Marks)