

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA SEM-IV Examination- Dec.-2011

Subject code: 640008

Date: 22/12/2011

Subject Name: Computer Graphics (CG)

Time: 10.30 am-01.00 pm

Total marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Correct following statements: **07**

- i. An RGB color system with 8 bits of storage per pixel is generally referred to as a full-color system.
- ii. For lines with slope equal to 1, $\delta x < \delta y$.
- iii. A convex polygon has at least one interior angle greater than 180° .
- iv. A `glSetColor*()` OpenGL function is used to specify an RGB/RGBA color.
- v. A 2-D rotation through angle θ about co-ordinate origin has inverse transformation matrix $R^{-1} =$

$$\begin{bmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & -\cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
- vi. Reflection can also be specified by rotation of object at 90° angle about a respective axis.
- vii. Vanishing points are associated with parallel Projection.

(b) Fill in the following blanks: **07**

- i. _____ OpenGL function is used to state the coordinate values for a single position.
- ii. _____ GLUT routine interacts with a window system to set color specifications into a table at a given index position.
- iii. _____ GLUT library function is used for deleting a display window that is already created.
- iv. _____ is a rigid body transformation that moves objects without deformation.
- v. A section of a two dimensional scene that is selected for display is called a _____.
- vi. The _____ clipping algorithm works only for rectangular windows.
- vii. The _____ parallel rays coming from infinity intersect the view plane with some angle.

Q.2 (a) i. Define : Virtual Reality, Data Visualization, Image Processing, Absolute Coordinate, Relative Coordinate **05**

- ii. What are the conditions required to transform world coordinate point into the same relative position within the viewport? **02**

	(b) i.	In reference to CRT, when two adjacent spots appear distinct?	02
	ii.	Explain Bresenham's Line Drawing algorithm.	05
OR			
	(b) i.	Briefly describe the importance of shadow mask.	02
	ii.	Explain Bresenham's Ellipse drawing algorithm.	05
Q.3	(a) i.	Explain scan line polygon fill algorithm.	05
	ii.	Draw a two dimensional viewing transformation pipeline.	02
	(b) i.	Explain Normalization Transformation for an orthogonal projection.	05
	ii.	Is Sutherland-Cohen line clipping algorithm applicable to any type of windows? Justify your answer.	02
OR			
Q.3	(a) i.	Explain Boundary Fill algorithm.	05
	ii.	What is OpenGL Projection Mode?	02
	(b) i.	Explain Perspective Projection.	05
	ii.	Which GLUT functions are used for current display window?	02
Q.4	(a) i.	Given a circle with radius $r = 10$, demonstrate midpoint circle algorithm by determining position along circle octant in first quadrant from $x = 0$ to $x = y$.	04
	ii.	Explain 2D rotation.	03
	(b) i.	Give the example of generating sorted edge table for polygon fill algorithm.	04
	ii.	List the equations of special cases for perspective projection.	03
OR			
Q.4	(a) i.	How one can distinguish between front and back face of polygon?	04
	ii.	Write down 3×3 homogeneous matrices for Translation, Rotation & Scaling.	03
	(b) i.	Write a floodfill4() function.	04
	ii.	What is oblique parallel projection vector?	03
Q.5	(a)	Show that the composition of two rotations is additive by concatenating the matrix representation for $R(\theta_1)$ and $R(\theta_2)$ to obtain : $R(\theta_1).R(\theta_2) = R(\theta_1 + \theta_2)$.	07
	(b) i.	Show the implementation of Sutherland-Hodgman algorithm for polygon clipping.	05
	ii.	In 2D graphics $[4 \ 2 \ 0]$ represents a point _____.	01
	iii.	The Perspective projection of point $(2,3,1)$ on $z = 0$ plane with eye placed at $(0,0,-5)$ is _____.	01
OR			
Q.5	(a)	Show that the reflection about line $y=x$, is equivalent reflection relative to the x-axis followed by a counter clockwise rotation of 90° .	07

- (b) i. A clipping window ABCD is located as follows: A(100,10), B(160,10), C(160,40), D(100,40). Using Sutherland-Cohen algorithm find visible portion of line segment EF and GH, where E(50,0), F(70,80), G(120,20), H(140,80). **05**
- ii. The following matrix defines _____ transformation.
- $$\begin{bmatrix} 1 & a & 0 \\ b & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
- 01**
- iii. An object is viewed by using perspective transformation equation. Then maximum number principal vanishing points possible are _____. **01**
