Subject: COMPUTER GRAPHICS

Time: 3 Hours **Max. Marks: 100**

JUNE 2011

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Frame buffer is

(A) The memory area in which the image, being displayed, is stored
(B) The device which controls the refresh rate
(C) The device used for displaying the colors of an image
(D) The memory area in which the graphics package is stored

b. A 24-bit plane color frame buffer with three 10-bit wide color look up tables can have _____ number of colors.

(A) 2^{24} **(B)** 2^{8}
(C) 2^{48} **(D)** 2^{30}

c. The slope of the line joining the points (1,2) and (3,4) is

(A) 0 **(B)** 1
(C) 2 **(D)** 3

d. If X_L , X_R ,Y_B ,Y_T represent the four parameters of x-left , x-right, y-bottom and y-top of a clipping window and (x, y) is a point such that $y>Y_T$ then (x, y) lies _____

(A) Inside the window **(B)** outside the window
(C) on the boundary of the window **(D)** none of these

e. An affine transformation is specified by the matrix

$$\begin{bmatrix} 3 & 0 & 5 \\ -2 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

The image Q of point P=(1,2)

(A) (8,2) **(B)** (2,8)
(C) (8,0) **(D)** (2,0)

f. The two dimensional matrix transformation for rotation with an angle θ with x-axis in anticlockwise direction is._____

(A) $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ **(B)** $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} -\cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ **(D)** $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

g. Perspective projection is characterized by the

(A) view plane alone
(B) direction of projection and the view plane
(C) centre of projection and the view plane
(D) centre of projection alone

h. Gouraud shading is

(A) An interpolative shading method **(B)** An averaging shading method
(C) A subdivision shading method **(D)** Not a shading method

i. Aliasing means

(A) rendering effect **(B)** shading effect
(C) staircase effect **(D)** cuing effect

j. The blending functions of Bezier curves are_____

(A) Splines **(B)** Bernstein polynomials
(C) Lagrangian polynomials **(D)** Newton polynomials

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. How color raster images are represented? Explain. **(8)**

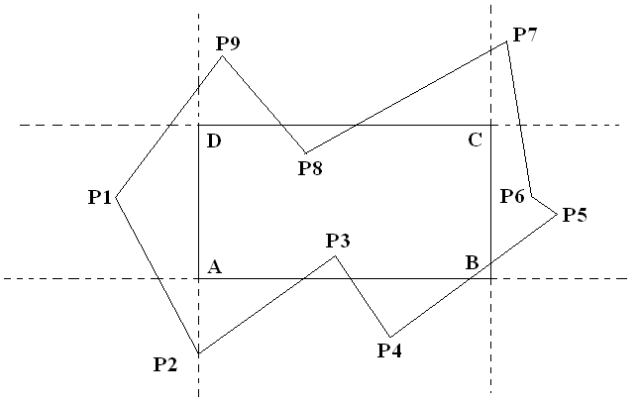
b. Explain the use of computer graphics in computer-aided design. **(8)**

Q.3 a. Write a callback routine to draw rectangles entered with mouse. **(8)**

b. Explain the window-to-viewport mapping. **(8)**

Q.4 a. Explain the Cohen-Sutherland line clipping algorithm. **(8)**

b. Clip the polygon P1,P2,.....,P9 in figure given below against the window ABCD using Sutherland Hodgman algorithm. **(8)**



Q.5 a. Perform a 45^0 counter clock wise rotation of triangle A(0,0) , B(1,1) , C(5,2) (i) about the origin and (ii) about (-1,-1). **(8)**

b. Describe the transforming of a coordinate system twice. **(8)**

Q.6 a. Consider the polygon with vertices P_o=(6,1,4) , P_1=(7,0,9) and P_2=(1,1,2). Compare the normal found using the Newell method with that found using the usual cross product. **(8)**

b. Explain the two-point and three-point perspective views. **(8)**

Q.7 a. Explain the Gourand shading method. **(8)**

b. Describe the depth buffer algorithm for removing hidden surfaces. **(8)**

Q.8 a. How the methods draw( ), read( ) and copy( ) are implemented directly in terms of openGL functions? Explain. **(8)**

b. Describe a recursive flood-fill algorithm. **(8)**

Q.9 a. Show that the Bezier form of curve segment is
$P(t) = (1-t)^3 P_0 + 3t (1-t)^2 P_1 + 3 t^2(1-t) P_2 + t^3 P_3$ **(8)**

b. Given vertices of Bezier B_0[1,1] , B_1[2,3] , B_2[4,3] & B_3[3,1] , find points on Bezier curve at t = (0.15, 0.35, 0.65, 0.85). **(8)**