Code: AC15 **Subject: COMPUTER GRAPH**
Time: 3 Hours **Max. Marks: 1**

DECEMBER 2010

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 half an hour 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. The coordinates of the point P(x,y) after reflection about origin will be

(A) P(–x, y) **(B)** P(–x, y)
(C) P(–x, –y) **(D)** P(x, y)

b. Which of the following does NOT figure into the Field of View of a pinhole camera?

(A) The direction of projection
(B) The distance from the center of projection to the projection plane
(C) The size of the projection plane
(D) None of these

c. The projection technique that has the direction of projection perpendicular to the viewing plane, but the viewing direction is NOT perpendicular to one of the principle faces is

(A) Orthographic Parallel Projection
(B) Axonometric Parallel Projection
(C) Oblique Parallel Projection
(D) Perspective Projection

d. During transformation from one position to another an object increases in size. Which of the following transformation is correct?

(A) Shear and translation **(B)** Rotation and scale
(C) Scale and shear **(D)** Translation and scale.

e. The mathematical expression for pure scaling transformation in 2D is

(A) $\begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix}$ **(B)** $\begin{bmatrix} S_x & S_x \\ 0 & S_y \end{bmatrix}$

(C) $\begin{bmatrix} S_x & 0 \\ S_y & S_y \end{bmatrix}$ **(D)** $\begin{bmatrix} 0 & 0 \\ 0 & S_y \end{bmatrix}$

f. One advantage of raster CRT is

(A) Solid area representation
(B) Aliasing effect detection and removal
(C) Low cost
(D) All of the above

g. The Phong reflection model simplifies light-matter interactions into (essentially) 4 vectors and a number of constants. Which of the following is NOT a vector needed for the Phong reflection model?

(A) Surface Normal **(B)** Direction to Viewer
(C) Direction to Material Center **(D)** Direction to Light

h. For a raster system with a resolution of 1024x1024, what is the size of frame buffer required to store 4 bits per pixel in bytes

(A) 1×2^{37} **(B)** 3×2^{19}
(C) 1×2^{19} **(D)** 2×2^{20}

i. When obtaining normals for a triangle, which of the following mathematical constructs is NOT used?

(A) Point-Point subtraction **(B)** Vector dot products
(C) Vector cross products **(D)** Vector normalization.

j. If a point is within the left top corner of a clipping rectangle, the region code with Cohen – Sutherland line clipping method is

(A) 0001 **(B)** 0010
(C) 1001 **(D)** 0110

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

Q.2 a. Explain the architecture of a cathode ray tube system and compare with flat panel system based on the principles of operation. **(8)**

b. Explain midpoint circle algorithm for drawing a circle and also explain properties of a circle? **(8)**

Q.3 a. Develop and implement a flood-fill algorithm to fill the interior of any specified area. **(8)**

b. Describe the Cyrus-Beck line-clipping algorithm to polygon clipping. **(8)**

Q.4 a. Magnify the triangle with vertices A(0,0) B(1,1) & C(5,2) to twice it's size while keeping C(5,2) fixed? **(8)**

b. A mirror is placed vertically such that it passes through the points (10,0) and (0,10). Find the reflected view of triangle ABC with co-ordinates A(5,50) B(20,40) & C(10,70). **(8)**

Q.5 a. Derive the following equation for transforming a co-ordinate point p(x,y) in one Cartesian system to the co-ordinate values (x', y') in another Cartesian system that is rotated by an angle θ, as in figure. Project point 'p' onto each of the four axes and analyse the resulting right triangles.

$x' = x \cos\theta - y \sin\theta$

$y' = x \sin\theta + y \cos\theta$ **(10)**

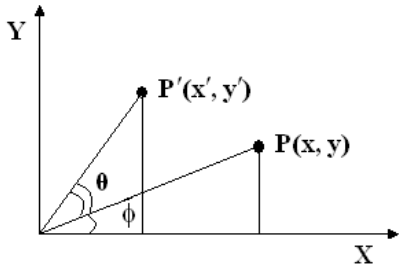

Fig. 1

b. Determine the Beizer blending function for five control points. Plot each function and label the maximum and minimum levels. **(6)**

Q.6 a. Write the routine to display any specified conic in the xy plane using a rational B-spline representation. **(8)**

b. Describe constructive solid geometry & Ray casting? **(8)**

Q.7 a. Briefly describe the painter's algorithm. **(8)**

b. Develop a procedure based on a back face detection technique for identifying all the visible faces of a convex polyhedron that has different coloured surfaces. **(8)**

Q.8 a. Describe normal vector interpolation shading. And explain advantages and disadvantages of the shading models? **(10)**

b. Describe the basic illumination models? **(6)**

Q.9 a. Explain fractal dimensions and describe geometry construction of deterministic self-similar fractals? **(8)**

b. Describe a key-frames system in computer graphics. **(8)**