

AMIETE – CS/IT (Current Scheme)

Time: 3 Hours

December - 2017

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

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. Reflection of a point about x-axis, followed by a counter-clockwise rotation of 90° , is equivalent to reflection about the line

(A) $x = y$	(B) $y = -x$
(C) $x = -y$	(D) $x + y = 1$
- b. The conic is parabola

(A) if the plane cuts one “nappe” of the cone	(B) if the plane cuts both nappes
(C) if the plane is parallel to the side of the cone	(D) None of these
- c. Which is not a property of Meshes?

(A) Planarity	(B) Concavity
(C) Convexity	(D) Solidity
- d. To store black and white images, black pixels are represented by_____ in the frame buffer and white pixels by_____

(A) One and Zero	(B) Zero and one
(C) Both (A) & (B)	(D) None of these
- e. The_____ combines the volumes occupied by overlapping 3D objects using set operations

(A) Beam penetration	(B) Sweep representation
(C) CSG Method	(D) None of these
- f. The center of display screen is computed as

(A) $X_{max}/2, Y_{max}/2$	(B) X_{max}, Y_{max}
(C) $X_{max}/3, Y_{max}/3$	(D) None of these

- g. Which of the following is NOT true about quaternions?
 (A) They are made up of 4 numbers
 (B) They should always be normalized to length 1
 (C) They can be used to define the rotation of an object
 (D) They can be used to represent all affine transforms
- h. If the direction of the projection is perpendicular to the view plane then it is called ____
 (A) oblique projection (B) orthographic projection
 (C) perspective projection (D) cavalier projection
- i. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ represents reflection along _____.
 (A) the line $y = x$ (B) y - Axis
 (C) x - Axis (D) None of these
- j. An isometric view is obtained when
 (A) the camera is pointing directly at one of the planes of the object.
 (B) the angles between the projections of the principal axes are equal.
 (C) the object is rotated by equal angles along the 3 principal axes.
 (D) the projection plane is parallel to one of the planes of the object.

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

- Q.2** a. What do you mean by frame buffer? Draw a block diagram showing the technique for scanning out an image from frame buffer to display surface. (8)
- b. Describe the working methodology of various input devices used for developing graphics applications. (8)
- Q.3** a. Explain Bresenham's Line Drawing Algorithm. Give a step wise solution to digitize the line with endpoints (5, 10) and (10, 20). (8)
- b. Write an OpenGL code to open an initial windows for drawing. Briefly explain any three functions used in the code. (8)
- Q.4** a. Write the pseudocode for the Cyrus-Beck clipper for a convex polygon, 2D case. (8)
- b. Explain the Cohen-Sutherland line clipping algorithm. (8)

- Q.5** a. Prove that simultaneous shearing in both directions (x and y directions) is not equal to the composition of pure shear along x-axis followed by pure shear along y-axis. (6)
- b. Perform a 45° rotation of triangle A (0, 0), B (1, 1), C (5, 2) (5+5)
(i) about the origin and (ii) about P(-1, -1).
- Q.6** a. Explain: (4+4)
(i) Perspective projection of a point
(ii) Perspective projection of a line
- b. Let $P_i (x_i, y_i, z_i)$, $i = 1, \dots, N$ be the vertices of a polygon not perfectly planar. Give the components of the normal vector $\vec{m}(m_x, m_y, m_z)$ to the polygon. (8)
- Q.7** a. Explain the Phong model for reflection of light from object surfaces to the viewer's eye. (8)
- b. What is diffuse scattering? (4)
- c. What is depth buffer algorithm? (4)
- Q.8** a. Using an appropriate diagram to illustrate your answer, describe the principle of a texture mapping technique that uses perturbation of surface normals to create texture effects. (8)
- b. Explain various anti-aliasing techniques. (4)
- c. Explain how pixmaps are manipulated and combined in raster displays. (4)
- Q.9** a. How curves are described by means of polynomial? (6)
- b. Give the applications of Bezier Curves and explain its properties. (10)