

Code: AC15

Subject: COMPUTER GRAPHICS

AMIETE –CS (OLD SCHEME)

Time: 3 Hours

JUNE 2012

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. What is the resolution of a 2*2 inch image that has 512*512 pixels?
- (A) 512 (B) 256
(C) 1024 (D) 4
- b. _____ is the process of expanding or compressing the dimensions of an object
- (A) Scaling (B) Rotation
(C) Transformation (D) Revolution
- c. When clipping is done directly against the view volume, it is called _____.
(A) Canonical clipping (B) Direct Clipping
(C) View Clipping (D) None of these
- d. The Painter's algorithm is also called _____.
(A) depth sort (B) priority algorithm
(C) (A) or (B) (D) None of these
- e. Which of the following is/are an approach to add surface texture?
(A) projected texture (B) texture mapping
(C) solid texture (D) All of these
- f. Affine transformations preserve _____.
(A) parallelism (B) angles
(C) distance (D) distance and angles

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- g. Which of the following is/are adverse side effects of scan conversion
- (A) staircase appearance (B) unequal brightness of slanted lines
(C) picket fence problem (D) All of these
- h. The matrix $\begin{pmatrix} 1 & a \\ b & 1 \end{pmatrix}$ defines a transformation called a _____.
- (A) Scaling (B) Simultaneous shearing
(C) View Clipping (D) None of these
- i. What is the maximum number of objects that can be handled by using the Z-buffer algorithm?
- (A) Arbitrary (B) One
(C) Four (D) None of these
- j. Refresh rate on a random-scan system depends on the number of _____ to be displayed.
- (A) points (B) lines
(C) square (D) angles

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

- Q.2** a. Differentiate between Raster-scan and Random-scan display. (4)
- b. Explain Bresenham's Line drawing algorithm for $|m| < 1$. Illustrate the algorithm by drawing a line with endpoints (20, 10) and (30, 18). (8)
- c. What steps are required to scan-convert a circle using Bresenham's algorithm? (4)
- Q.3** a. Discuss aliasing effects of scan conversion. What is anti-aliasing? (6)
- b. Let R be the rectangular window whose lower left-hand corner is at L(-3,1) and upper right-hand corner is at R(2,6). Find the region codes for the end-points of the lines AB, CD, EF, GH and IJ where A(-4,2), B(-1,7), C(-1,5), D(3,8), E(-2,3), F(1,2), G(1,-2), H(3,3), I(-4,7) and J(-2,10). Use the Cohen-Sutherland algorithm to clip the line segments. (10)
- Q.4** a. Perform a 45° rotation of triangle A(0,0), B(1,1), C(5,2) (a) about the origin (b) about P(-1,-1). (8)
- b. Magnify the triangle with vertices A(0,0), B(1,1) and C(5,2) to twice its size while keeping C(5,2) fixed. (8)

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- Q.5** a. What is perspective projection and vanishing points? The process of constructing a perspective view introduces certain anomalies which enhance realism in terms of depth cues but also distort actual sizes and shapes. Discuss. Also discuss two important properties of perspective projection. (10)
- b. Discuss Phong Reflectance Model. (6)
- Q.6** a. Write five properties of B-spline curves (5)
- b. Find the Bézier curve which has the starting at the point $\{x_0, y_0\} = \{2, 2\}$ and destination point $\{x_2, y_2\} = \{4, 1\}$ which has the control points $\{x_1, y_1\} = \{1, 1.5\}$ and $\{x_2, y_2\} = \{3.5, 0\}$, respectively. Use the parametric equations to form the Bézier curve. (6)
- c. Write down equation for k-order B-spline with $n+1$ control points $(P_0, P_1, \dots, P_n)$. Define uniform, open-uniform and non-uniform knot vectors. (5)
- Q.7** a. What do you mean by CSG? Give examples. How do you implement CSG operation when objects are described with boundary representation? (6)
- b. What is Mandelbrot set? How it is created? Use $c = -0.2 + 0.5i$ to demonstrate. (6)
- c. Differentiate between shading and rendering. (4)
- Q.8** a. Explain Painter's algorithm. What it is used for? How can you extend the painter's algorithm to make back-to-front ordering of polygons fast for any eye location and to divide polygons to avoid overlaps? Explain. (10)
- b. Summarize the steps of a depth-buffer algorithm (6)
- Q.9** Write a brief note on any **FOUR** the following:
- (i) Octree representation
 - (ii) Tablets
 - (iii) Cyrus Beck algorithm
 - (iv) Morphing
 - (v) Gouraud shading
- (4×4)