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

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)**

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 $\{x_3, y_3\} = \{4, 1\}$ 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, ... , 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)**