ROLL NO. _____

Code: AC60/AT60 **Subject: COMPUTER GRAPHICS**

AMIETE – CS/IT

Time: 3 Hours **DECEMBER 2014** **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. In Bresenham's circle algorithm, we don't require

(A) Floating-point arithmetic
(B) Calculation along the line to pixel centre
(C) Multiplication or division
(D) All of these

b. In the Cohen-Sutherland line clipping algorithm, "trivial reject" means

(A) That the intersection is trivial to compute
(B) That the boundaries on the visible side of the line are incomplete
(C) That the process of rejection is always trivial
(D) That the line is not visible when its end points are on the invisible side of a clipping boundary

c. A Touch-Screen is recommended for

(A) Pressure sensitive drawing and input
(B) Pressure that tracks user
(C) Program involving public input and simple tasks
(D) Day-to-Day computer work

d. The center of display screen is computed as

(A) Xmax, Ymax **(B)** Xmax/2, Ymax/2
(C) Xmax/3, Ymax/3 **(D)** None of these

e. All hidden surface algorithms employ image space approach except

(A) Back face removal **(B)** Depth Buffer method
(C) Scan-Line method **(D)** Depth-sort method

f. Compute the size of a 640×480 image at 240 pixels per inch

(A) $\frac{8}{6}$ inches **(B)** $\frac{4}{8}$ inches

(C) $\frac{5}{6}$ inches **(D)** $\frac{6}{8}$ inches

g. Which of the following is not a valid sub category of orthographic projection

(A) Isometric **(B)** Diametric
(C) Trimetric **(D)** Quadmetric

h. The maximum number of objects that can be presented by using the z-buffer algorithm

(A) One **(B)** Infinite
(C) Two **(D)** Arbitrary

i. The principal vanishing points for the standard perspective transformation are

(A) (0, 0, 1) **(B)** (0, 0, 0)
(C) (1, 0, 0) **(D)** (1, 1,1)

j. The general form of a scaling matrix with respect to a fixed point p(h, k) is

(A) $\begin{bmatrix} a & 0 & -ah+h \\ 0 & b & -bk+k \\ 0 & 0 & 1 \end{bmatrix}$ **(B)** $\begin{bmatrix} a & 0 & ah+h \\ 0 & b & -bk+k \\ 0 & 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} a & 1 & -ah+h \\ 1 & b & -bk+k \\ 1 & 1 & 1 \end{bmatrix}$ **(D)** $\begin{bmatrix} a & 1 & ah+h \\ 1 & b & bk+k \\ 1 & 1 & 1 \end{bmatrix}$

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

Q.2 a. How a raster image is created? Discuss the three principal sources of creating them. **(8)**

b. Differentiate between line-drawing displays and raster displays. **(4)**

c. Define color lookup table.
How many different colors can be displayed in a graphic system when the color depth is 8 bits and look up table entry is 12 bits wide? **(4)**

Q.3 a. Give the Open GL code for drawing the dot plot of a function. **(8)**

b. Define the terms window & Viewport. Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3, 5) onto
(i) Viewport that is the entire normalized device screen.
(ii)Viewport that has lower left corner at (0, 0) and upper right corner at (½, ½) **(8)**

Q.4 a. How Cohen Sutherland line clipping algorithm differs from Cyrus-Beck line algorithm? Discuss all cases of line clipping, which arise in Cohen Sutherland algorithm. Draw suitable diagram to discuss the cases. **(8)**

b. Use the Cohen Sutherland algorithm to clip $P_1(70,20)$ and P_2 (100, 10) against a window with lower left hand corner (50, 10) and upper right hand corner (80, 40). **(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. **(5)**

b. Find the transformation matrix that reduces the square ABCD, whose centre is at (2, 2), to half of its size, with centre still remaining at (2, 2). The coordinates of the square ABCD are A(0,0), B(0,4), C(4, 4) and D(4, 0) Find the coordinates of new square. **(7)**

c. Define and explain Affine transformations. **(4)**

Q.6 a. Discuss and explain the taxonomy of projections. **(8)**

b. Consider the polygon with vertices **(8)**
$P_0 = (6, 1, 4)$
$P_1 = (7, 0, 9)$
$P_2 = (1, 1, 2)$
Find the normal to this polygon using Newell's Method.

Q.7 a. What is the need of the concept of "Shading in computer Graphics"? List the merits and demerits of Phong shading. **(6)**

b. Write the pseudo code for the z-buffer algorithm for visible surface detection. What is the maximum number of objects that can be handled by z-buffer algorithm? Give two advantages and two disadvantages of z-buffer algorithm. **(10)**

Q.8 a. Discuss the different ways to define a region. Also differentiate between them. **(8)**

b. Define Aliasing. Discuss the different anti-aliasing techniques. **(8)**

Q.9 a. Explain the terms "Parametric continuity" and "Geometric continuity" in Bezier curves. **(5)**

b. Write any three properties of Bezier curve. What are the limitations of Bezier curves? **(5)**

c. A Bezier curve is to be drawn, given the control points $P_1(40,40)$, $P_2(10, 40)$, $P_3(10, 60)$, $P_4(60, 0)$. Calculate the coordinates of the points on the curve corresponding to the parameter t = 0.2, 0.4, 0.6. Draw a graph sketch of the curve and show coordinates of various points on it. **(6)**