Code: CS40   **Subject: COMPUTER GRAPHICS**

ALCCS – OLD SCHEME

**Time: 3 Hours**   **AUGUST 2012**   **Max. Marks: 100**

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

NOTE:
- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**
- **All calculations should be up to three places of decimals.**

Q.1   a. Write the matrices of rotation through $120°$ in the counter clockwise direction. Investigate its effect on the points O(0, 0) and A(2, 3).

   b. List the steps involved in 2D reflection through an arbitrary line.

   c. Write Bresenham's line – Drawing algorithm for $|m| < 1$.

   d. Briefly explain Antialising.

   e. What do you mean by line clipping? Name three line clipping algorithms.

   f. What are B-spline curves? Mention any two properties of B-spline curves.

   g. What do you understand by Fractal Dimension.   **(7 $\times$ 4)**

Q.2   a. Consider the line from A(0, 0) to B(5, 5). Use DDA algorithm to rasterize the line AB. Plot the output.   **(9)**

   b. Use the circle generation algorithm to generate the first quadrant of the circle with centered at origin having radius 8. Plot the output.   **(9)**

Q.3   a. Consider the clipping window and the line P_1P_2 as given below:
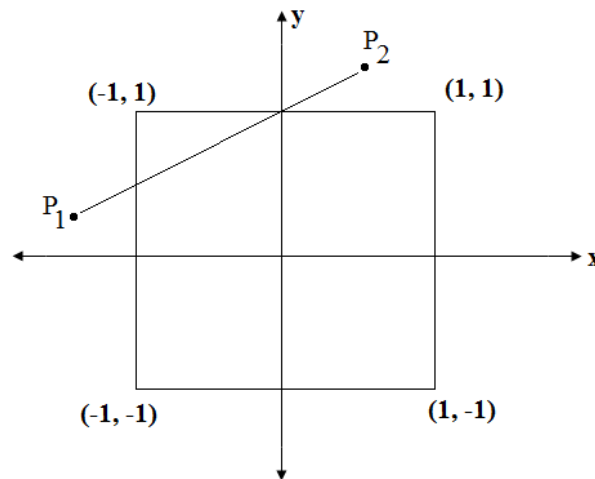
Where P_1 is $\left(-\dfrac{3}{2}, \dfrac{1}{6}\right)$ and P_2 is $\left(\dfrac{1}{2}, \dfrac{3}{2}\right)$. Clip the line P_1P_2 using Cohen-Sutherland line clipping algorithm. **(9)**

b. Use Cyrus-Beck algorithm to clip the line $P_1(1,1)$ to $P_2(7,3)$ with respect to the clipping window given by $0 \le x \le 8, 0 \le y \le 4$. **(9)**

Q.4 a. Consider the triangle ABC in the xy-plane where A, B, C are (2, 4), (4, 6) and (2, 6) respectively. Obtain and plot the triangle $A^*B^*C^*$ which is the reflection of $\triangle ABC$ in the line $y = \dfrac{1}{2}(x+4)$. **(12)**

b. Obtain the matrices of three dimensional rotation about x, y and z-axes. **(6)**

Q.5 a. Consider the four two-dimensional position vectors $P_1(0,0), P_2(1,1), P_3(2,-1)$ and $P_4(3,0)$ with tangent vectors $P_1'[1 \ \ 1]$ and $P_4'[1 \ \ 1]$. Determine the normalized piecewise cubic spline curve through them. **(10)**

b. Write a short note on Bezier curves stating some of their properties. **(8)**

Q.6 a. Describe the scan-line method for detecting hidden / visible surfaces. **(9)**

b. Write Depth-sorting algorithm for detecting hidden / visible surfaces. **(9)**

Q.7 a. Explain briefly any one of the following stating its advantages over the other:
   (i)   Gourand shading method.
   (ii) Phong shading method. **(8)**

b. Write a short note on Morphing. **(5)**

c. Explain a method of simulating acceleration at the beginning followed by de-acceleration at the end between two given key frames in an animation clip. **(5)**