EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
THIRD YEAR EXAMINATION IN SCIENCE (2010/2011)
FIRST SEMESTER (March/April., 2013)
CS 301 COMPUTER GRAPHICS
PROPER & REPEAT

Answer all Questions   **Time: 2 Hours**

Q1)

a) Define in your own words what a *Computer Graphics* is.

b) Briefly describe applications of *Computer Graphics*.

c) State the differences between *raster scan display* & *random scan display*.

d) Explain the steps of scan line polygon filling.

e) Consider the *Midpoint circle* algorithm:

   i. Derive the necessary equations to generate *Midpoint circle* algorithm.

   ii. Write the *Midpoint circle* algorithm.

   iii. Get all the pixel co-ordinates to draw a circle of radius r = 10 with center (8, 8).

    (*Apply this algorithm*)

   iv. Describe how the above algorithm can be used to draw a full circle.

Q2)

a) Describe all basic transformation that would be useful in two-dimensional graphics and give the transformation matrices in homogeneous system.

b) Consider the following figure:
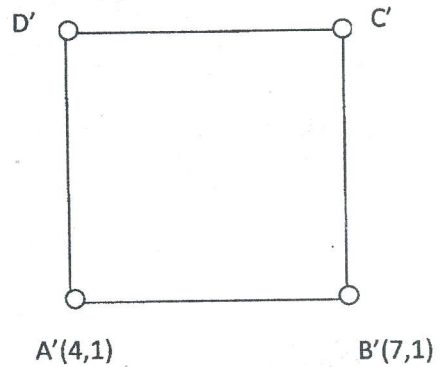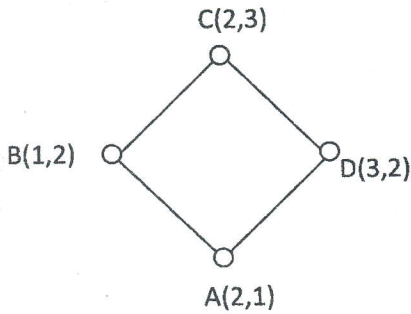
i. Give a matrix, or product of matrices, that will transform the unit square ABCD into the square A'B'C'D'.

ii. Find out the coordinates of C' and D'.
   (Draw the appropriate figures with corresponding coordinates)

c) Explain the Shear transformations using suitable example.

Q3)

a) Define the terms 2D *Clipping* and *Clip window* in Computer Graphics.

b) List out the types of Clipping.

c) Describe the 2D viewing transformation pipe line.

d) Briefly describe the *Brute force Approach* in Computer Graphics.

e) Write down the Liang-Barsky Line Clipping method.

f) Let W be a window whose bottom-left corner is (1,2) and the top right corner is (9,8). Apply Liang-Barsky Line Clipping algorithm to clip the following lines against W.

    i. AB be a straight line with A= (6, -2) and B= (14, 4).

    ii. SY be a straight line with S= (2, 3) and Y= (8, 4).

    iii. PQ be a straight line with P= (6, 6) and Q= (8, 9).

    iv. CD be a straight line with C= (-1, 7) and D= (11, 1).

       (Show appropriate steps).

Q4)

a) Briefly describe the *projection* in Computer Graphics.

b) Give the transformation matrix in Homogeneous coordinate system for the following 3D viewing:

    i. *Parallel projection;*

    ii. *Perspective projection.*

c) Give transformation matrix that scale an object about the fixed point $F(x_f, y_f, z_f)$, with the scaling factors S_x, S_y, and S_z in the x-axis, y-axis and z-axis directions, respectively.

d) Consider the tetrahedron PQRS, Where P = (5, 5, 5), Q = (20, 0, 0), R = (0, 20, 0), S = (0, 0, 20). Suppose this object is scaled about the fixed point P = (5, 5, 5) with the uniform scaling of 2.

Draw the images of the object obtained by the perspective projection on XY-plane with reference point at (0, 0, 25) and the orthographic parallel projection on XY-plane after the scaling.

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