



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

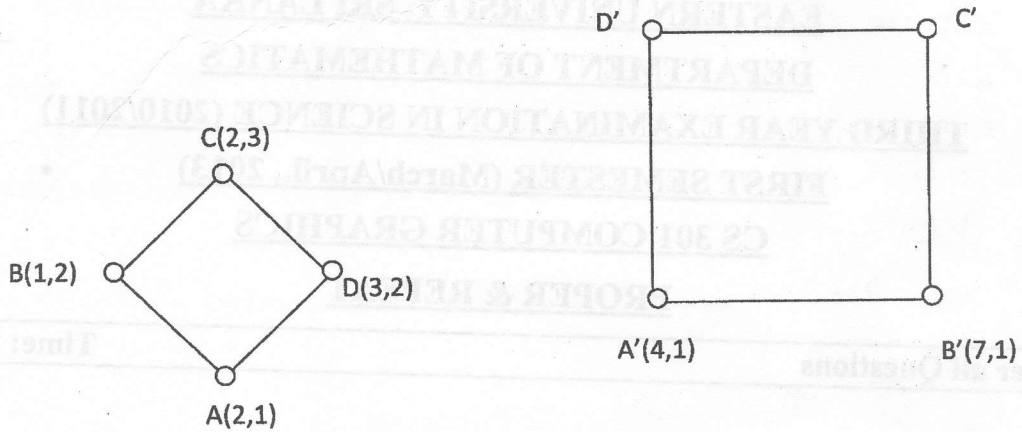
Time: 2 Hours

Q1)

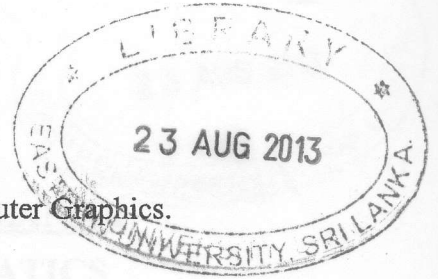
- a) Define in your own words what a *Computer Graphics* is.
- b) Briefly describe applications of *Computer Graphics*.
- c) State the differences between *raster scan display* & *random scan display*.
- d) Explain the steps of scan line polygon filling.
- e) Consider the *Midpoint circle* algorithm:
 - 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)

- Define the terms *2D Clipping* and *Clip window* in Computer Graphics.
- List out the types of Clipping.
- Describe the 2D viewing transformation pipe line.
- Briefly describe the *Brute force Approach* in Computer Graphics.
- Write down the Liang-Barsky Line Clipping method.
- 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 .

- AB be a straight line with $A = (6, -2)$ and $B = (14, 4)$.
- SY be a straight line with $S = (2, 3)$ and $Y = (8, 4)$.
- PQ be a straight line with $P = (6, 6)$ and $Q = (8, 9)$.
- CD be a straight line with $C = (-1, 7)$ and $D = (11, 1)$.

(Show appropriate steps).

Q4)

- Briefly describe the *projection* in Computer Graphics.
- Give the transformation matrix in Homogeneous coordinate system for the following 3D viewing:
 - Parallel projection*;
 - Perspective projection*.
- 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.
- 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.

*****End*****