

EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE 2002/2003
FIRST SEMESTER (June/July, 2003)

CS301 Computer Graphics

Answer all questions

Time allowed: 2 Hours

Q1 Answer all parts.

- (a). Define the graphics terms **window** and **viewport**. When displaying objects we could clip them either at the level of window or at the level of viewport. Give an algorithm to clip points and straight lines clip at each of the levels.
- (b). Suppose you are required to draw a circle by plotting points. Give an algorithm to draw the circle using **midpoint circle** technique, with necessary clipping.

Using your algorithm compute successive points to plot in the display in order to draw the first quarter of the circle with centered at (5,10) and radius 7.

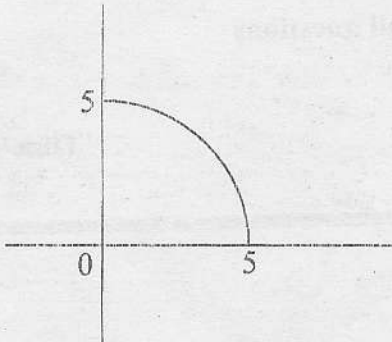
Q2 Describe and distinguish Flood-Fill algorithm and Boundary-Fill algorithm to fill regions in a raster display.

A white circle is drawn on a raster display with black background. Several dots of different colours also appear inside the circle. You are required to remove the dots by filling the circular region with yellow colour, and to change the background colour to green.

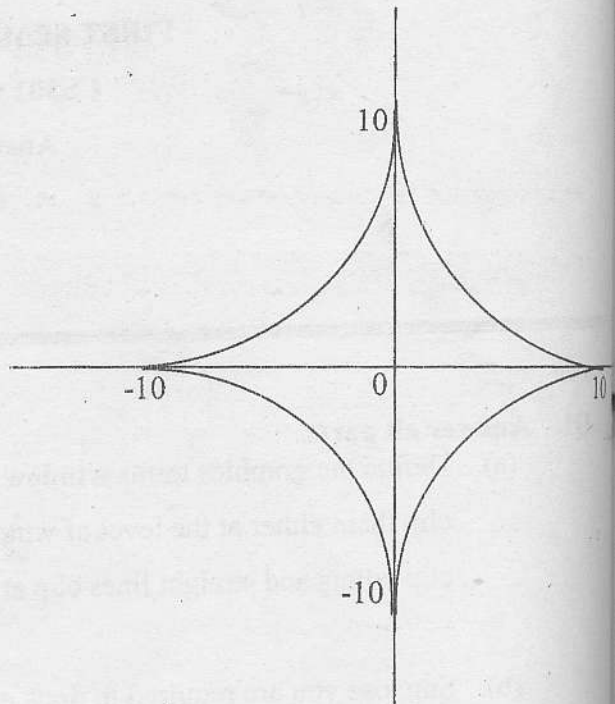
Write an algorithm to perform this task using the algorithms in part (a). State clearly any assumptions you have made.

Q3 Describe briefly the basic transformations that would be useful in two-dimensional graphics. Explain how homogeneous coordinates would be useful in geometric transforms of objects.

Consider the figures:



Primitive object



Compound object

Describe how you would draw the **compound object** from the **primitive object**. Give all the transformations needed in each step.

Q4 Obtain a projection transformation matrix that would yield the orthographic parallel projection on XY-plane.

Give transformation matrix that rotate an object about the X-axis through an angle β .

Consider the unit cube ABCDEFGH, where $A=(0, 1, 0)$, $B=(1, 1, 0)$, $C=(1, 1, -1)$, $D=(0, 1, -1)$, $E=(0, 0, 0)$, $F=(1, 0, 0)$, $G=(1, 0, -1)$, $H=(0, 0, -1)$.

Suppose this object is rotated about X-axis through 60° . Draw the image of the object obtained by the orthographic parallel projection on XY-plane before and after rotation.

If the object is rotated about X-axis through 90° , what differences you would notice in the images of the object obtained by the orthographic parallel projection on XY-plane before and after rotation.