

Computer Graphics

Con. 3059-09.

VR-3780

(REVISED COURSE)

(3 Hours)

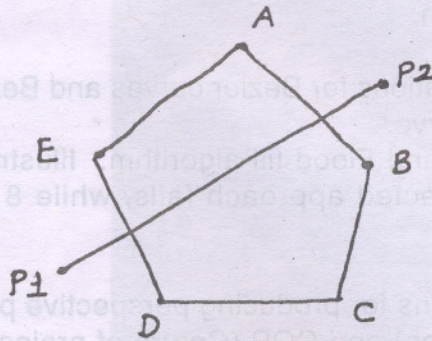
[Total Marks : 100

N.B.: (1) Question No. 1 is compulsory.

(2) Attempt any **four** questions out of remaining **six** questions.(3) Assume **suitable** data if **necessary** and justify the same.(4) **Figures** to the **right** indicate **full marks**.

(5) Programming language can be C/C++/JAVA.

1. (a) Explain Cyrus-Beck line clipping algorithm and solve the following example 10
using it. Window is specified by following polygon ABCDE and line to be
clipped is P1 P2.

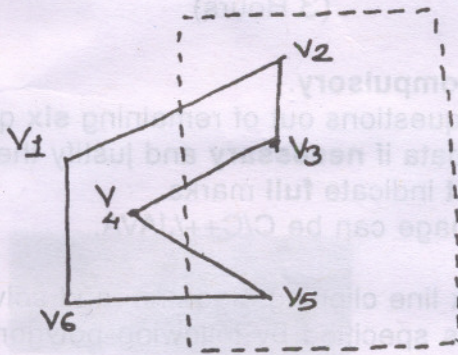


A (75, 100), B (150, 75), C(100, 50), D(50, 50), E(25, 75) P1(25, 50), P2(150, 75).
Calculate P1' and P2'. Note that figure is not to the scale.

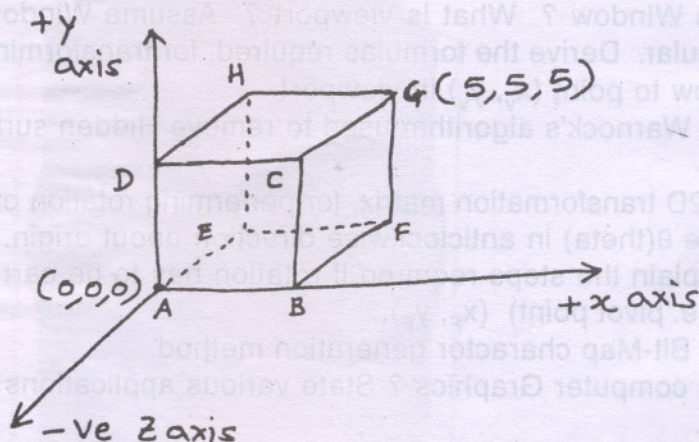
- (b) Explain Display File Structure. How one can enter polygon into display file? 5
(c) Explain even-odd test to determine whether the point is inside or outside of 5
polygon.
2. (a) What is Window ? What is viewport ? Assume Window and viewport are 8
rectangular. Derive the formulas required, for transforming a point (x_w, y_w) in
a window to point (x_v, y_v) in viewport.
- (b) Explain Warnock's algorithm used to remove Hidden surfaces with example. 12
3. (a) Derive 2D transformation matrix, for performing rotation of given point P(X, Y) 10
by angle θ (theta) in anticlockwise direction about origin.
Also explain the steps required if rotation has to be carried out about Fixed
Point (i.e. pivot point) (x_F, y_F) .
- (b) Explain Bit-Map character generation method. 5
(c) What is computer Graphics ? State various applications of it. (Specify only 5
names).

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4. (a) Explain Sutherland-Hodgman Polygon clipping algorithm, with example. What modification is required on it so that it should also work on following figure. (i.e. concave polygon) 12



- (b) Explain mid-point circle algorithm. In order to support your explanation, show mathematical derivation. 8
5. (a) State mathematical equations for Bezier curves and Bezier Surfaces. Explain properties of Beizer Curve. 10
- (b) Compare Boundary fill and Flood fill algorithm. Illustrate one example with diagram where 4-connected approach fails, while 8 connected approach succeeds. 10
6. (a) Derive the transformations for producing perspective projection of an object, in xy plane (viewing plane) and COP (Centre of projection) co-ordinates are (a, b, c). 12
- (b) What are Fractals ? Give classification of Fractals. What is Fractal dimension ? 8
7. (a) What do you mean by segment ? What are the various attributes in segment table ? State which operations can be done on segment and explain the same. 8
- (b) Consider the cube shown in the diagram. 12



Each side of the cube is 5 units. Co-ordinates of A are (0, 0, 0), co-ordinates of G are (5, 5, 5)

In order to perform rotation of cube about the axis joining vertices A and G by angle 45° in anticlockwise direction, while looking from point G towards origin i.e. pt. A., which transformations are required and specify the matrices for the same.