Con. 5531-07.   (REVISED COURSE)   **CD-5572**

(3 Hours)   [**Total Marks : 100**]

N. B. : (1) Question No. **1** is **compulsory**.
  (2) Attempt any **four** questions out of remaining i.e. **2** to **7**.
  (3) Figures to **right** indicate **full** marks.
  (4) Figures supporting answers should be **neat** and **clean**.

1. (a) With reference to 3 D transformations, describe the steps to be carried out when   12
  an object is to be rotated about an axis that is not parallel to any of the co-ordinate
  axis specify all the required matrices. State your assumptions clearly.
  (b) Write and explain the Depth Buffer algorithm for detecting visible surface.   8

2. (a) Derive the transformations for producing perspective projection of an object, in xy   12
  plane (viewing plane) and COP (centre of projection) co-ordinates are (a, b, c).
  (b) Write notes on CSG and B-REP technic.   8

3. (a) Compare boundary fill and flood fill algorithm. Write a function to fill a region, whose   10
  boundaries are of different color, using 8 connected approach.
  (b) State mathematical equations for Bezier Curves and Bezier Surfaces. Explain properties   10
  of Bezier Curve.

4. (a) Find the clipping co-ordinates to clip the line segment AB against the window using   10
  Cohen-Sutherland line clipping algorithm.
    A (120, 60), B (160, 92)
    $X_{w\,min} = 100$ $Y_{w\,min} = 80$
    $X_{w\,max} = 150$ $Y_{w\,max} = 100$
  (b) Explain working of Raster scan display and Random scan display and compare them.   10

5. (a) Explain Gourad and phong shading.   10
  (b) Prove the following   10
    1. Two successive rotations are additive
      i.e. R (θ1). R (θ2) = R (θ1 + θ2)
    2. If $S_x = S_y$ or $\theta = n\,\pi$ prove that 2D rotation and scaling compute.

6. (a) Derive the Bresenham's line drawing algorithm for lines with slope < 1. Use it to   12
  digitize the line with end points A (40, 10) and B (50, 16). Calculate first 3
  points only.
  (b) Explain scan-line fill algorithm to fill 2D area.   8

7. (a) Explain Liang-Barsky line clipping algorithm with example.   10
  (b) Write notes on Halftoning and Dithering technics.   10