N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from remaining i.e. **Q. 2** to **Q. 7**.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Derive Mid Point Circle Algorithm; Hence state the algorithm.   **10**
    (b) Explain Inside-Outside Tests.   **5**
    (c) Explain Direct View Storage Tubes.   **5**

2. (a) Write a pseudo-code procedure to implement boundary-fill and flood-fill algorithm   **5**
    using the 4-connected definition for region pixels.
    (b) Express window to viewport mapping in the form of composite transformation   **15**
    matrix. Also find complete viewing transformation that maps a window in world
    co-ordinates with x and y extent 1 to 10 onto a viewport with x extent $\frac{1}{4}$ to $\frac{3}{4}$
    and y extent 0 to $\frac{1}{2}$ in normalized device space, and then maps a workstation
    window with x extent $\frac{1}{4}$ to $\frac{1}{2}$ and y extent $\frac{1}{4}$ to $\frac{1}{2}$ in the normalized device
    space into a workstation viewport with x extent 1 to 10 and y extent 1 to 10 on
    the physical display device.

3. (a) Explain Cohen-Sutherland line clipping technique.   **10**
    (b) Explain Liang-Barsky line clipping technique.   **10**

4. (a) What do you understand by the terms parallel and perspective projection ? Also   **10**
    explain depth cueing.
    (b) Explain all 3-D transformations alongwith matrix representations.   **10**

5. (a) Explain DDA algorithm. Solve (1, 1) to (5, 3) using DDA algorithm.   **5**
    (b) Solve using Bresenham's line drawing algorithm (20, 10) to (30, 18).   **5**
    (c) Explain the two techniques for producing color displays with CRT.   **10**

6. (a) Write Mid-Point Ellipse Algorithm solve $r_x = 8$ and $r_y = 6$.   **10**
    (b) Explain Goroud Shading & Phong Shading.   **10**

7. Write short notes on :—   **20**
    (a) Z-Buffer Method
    (b) Scanline Method
    (c) Area Subdivision Method
    (d) Properties of B-spline Curves.