

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) **All** questions are **compulsory**.  
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.  
 (3) Answers to the **same question** must be **written together**.  
 (4) Numbers to the **right** indicate **marks**.  
 (5) Draw **neat labeled diagrams** wherever **necessary**.  
 (6) Use of **Non-programmable** calculators is **allowed**.

1. **Attempt any three of the following:**

- What is computer graphics? Explain computer graphics applications and software. 15
- Explain the operation of CRT with a neat labelled diagram.
- Distinguish between raster scan display device and random scan display device.
- Consider a line AB with A= (0, 0) and B= (-5,-5). Apply a simple DDA algorithm and calculate the pixels on the line.
- Explain the acceptance and rejection test using bit codes in Cohen-Sutherland line clipping algorithm. List the steps of the algorithm and give suitable example to explain the concept.
- Explain Liang-Barsky algorithm for clipping a line and also find the clipping coordinates for a line PQ where P=(10,10) and Q=(60,30), against window with  $(X_{wmin}, Y_{wmin})=(15,15)$  and  $(X_{wmax}, Y_{wmax})=(25,25)$ .

2. **Attempt any three of the following:**

- Describe transformations and matrices in detail. 15
- Using homogeneous coordinate transformation matrix, rotate the triangle ABC with A= (2, 3), B= (5, 5), and C= (4, 3) by an angle  $45^\circ$  about the point (1, 1).
- Write a short note on reflection through an arbitrary line in brief.
- Shear a unit cube situated at origin with a shear transformation matrix:

$$T_{shear} = \begin{bmatrix} 1 & -0.85 & 0.25 & 0 \\ -0.75 & 1 & 0.7 & 0 \\ 0.5 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- Define vanishing point and also explain vanishing point in different perspective projection in detail.
- What is meant by view volume? Explain it with different types of projections.

3. **Attempt any three of the following:**

- Explain with neat labelled diagram stages in 3D viewing pipeline. 15
- Explain different coordinates systems and matrices in detail.
- What is light? Explain Radiometry in brief.
- Explain different properties of Bidirectional Reflectance Distribution Function (BRDF).

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- e. Explain any two color spaces in detail.
- f. Write a short note on chromatic adaptation.

4. Attempt any three of the following:

- a. Write a short note on back face removal technique.
- b. What is meant by BSP trees? Explain algorithm for construction of it with example.
- c. Explain visible surface ray tracing in brief with neat labelled diagram.
- d. Explain parametric representation of hyperbola.
- e. Explain implicit and explicit curve representation in detail.
- f. Explain Bezier Surfaces in detail and state it's any five properties.

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5. Attempt any three of the following:

- a. What is an animation? Explain any two principles of animation in detail.
- b. Explain procedural techniques in brief.
- c. Explain different types of deformation in detail.
- d. What is an Image? Explain any five image formats.
- e. Distinguish between lossy and lossless compression.
- f. Explain the concept of histogram equalization. Equalize the following histogram for  $L=8$ .

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Gray Level	0	1	2	3	4	5	6	7
No. of pixel	790	1023	850	656	329	245	122	81