

No. of Printed Pages : 4

Sl. No.

C1-R4 : ADVANCED COMPUTER GRAPHICS

DURATION : 03 Hours

MAXIMUM MARKS : 100

Roll No. :

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Answer Sheet No. :

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Name of Candidate : _____ ; **Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.
- Parts of the same question should be answered together and in the same sequence.
- Questions are to be answered in the ANSWER SHEET only, supplied with the Question Paper.
- Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. (a) What is the working principle of the clipping algorithm ? Differentiate between the point clipping algorithm and line clipping algorithm.
 (b) Explain the concept of the Pigeon Hole principle with suitable example.
 (c) Define Parametric Bicubic Surfaces. List out some of its properties.
 (d) Differentiate between the Specular Reflection and Phong model in the context of shading and rendering.
 (e) Explain the process of creating raster animations in computer graphics. Write down a step-by-step procedure for creating a simple raster animation.
 (f) Explain in brief the common factors by which Intensity attenuation occurs.
 (g) Consider two octrees representing two 3D objects:
 Octree A: Depth: 3, Number of nodes: 30, Number of leaf nodes: 15
 Octree B: Depth: 3, Number of nodes: 25, Number of leaf nodes: 12
 Perform a Boolean union operation on octrees A and B to merge them into a single octree. Determine the depth, number of nodes, and number of leaf nodes of the resulting octree. (7x4)

2. Draw suitable diagrams in each case and answer the following using the concave or convex lens :
 (a) Where is the real image formed when the object is placed at infinity ?
 (b) Where is the real image formed when an object is placed beyond the centre of curvature ?
 (c) Where is the real image formed when an object is at the centre of curvature ?
 (d) Where is the real image formed when an object is placed in between the centre of curvature and focus ? (4.5x4)

3. (a) Suppose the RGB color is represented by the values (R, G, B) = (150, 75, 200). Find the equivalent HSV color space values.
 (b) Consider two convex polygons, P and Q, defined by their vertices as follows :
 Polygon P: {(2, 2), (2, 6), (5, 7), (8, 6), (8, 2)}
 Polygon Q: {(4, 4), (6, 8), (7, 5), (6, 2), (4, 2)}
 Perform polygon clipping of polygon P against polygon Q. Provide the resulting clipped polygon. (9+9)

4. (a) Explain the concept of Polygon Meshes in computer graphics. Compare and contrast Polygon Meshes with other representations of geometry.
 (b) Explain the following algorithms used in computer graphics :
 (i) Appel's Algorithm
 (ii) Z-Buffer Algorithm
 (iii) Depth-sort Algorithm (9+9)

5. (a) What do you mean by illumination model ? Discuss any two illumination models in detail.
- (b) What do you mean by Axonometric Projection? What are the salient features of Axonometric Projection ? How does it differ from Trimetric Projections ? (9+9)

6. (a) Explain solid modeling with its properties. Describe in brief different solid modeling methods.
- (b) Explain the basic differences between parallel and perspective projection. Also, derive the transformation matrix for oblique projection. (9+9)

7. (a) A triangle ABC, which has three points A [3 -1], B [4 1], and C [2 1], is rotated by 90° about the origin in counterclockwise direction. Calculate the position vectors of the rotated triangle.
- (b) Find the transformation that rotates an object point P (x, y) by θ° about a fix centre of rotation (l, m).
- (c) Given a triangle with points (1, 1), (0, 0) and (1, 0). Assume shear parameter towards X direction (Sh_x) and Y direction (Sh_y) have values 2 and find out the new coordinates of the object. (6+6+6)

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SPACE FOR ROUGH WORK