No. of Printed Pages : 4

Sl. No.

C1-R4 : ADVANCED COMPUTER GRAPHICS

DURATION : 03 Hours **MAXIMUM MARKS : 100**

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

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) Discuss the advantages of B-spline curves over Bezier curves.

(b) Distinguish between parallel and perspective projections with a neat and clean diagram.

(c) What is the HSV colour model ? How does it differ from RGB colour model ?

(d) Discuss the working principle of the Z-buffer algorithm.

(e) Explain the role of halftone patterns and dithering in image rendering.

(f) What is the purpose of interactive picture construction techniques ? Explain any two of them.

(g) What do you mean by primitive instancing in solid modelling ? Explain with an example.

(7x4)

2. (a) Define and explain the 3D viewing pipeline. Illustrate how view volume and projection transformations are used in the process.

(b) Derive the transformation matrix for a perspective projection onto the $z = 0$ plane from a centre of projection at (0, 0, d).

(10+8)

3. (a) Explain the methods to represent polygon meshes. For a given triangular pyramid, provide vertex and edge list representation.

(b) Differentiate between Boundary Representation and Constructive Solid Geometry methods with examples.

(9+9)

4. (a) A triangle has vertices at A (2, 0, 0), B (0, 2, 0), and C (0, 0, 2). A point light source is at (0, 0, 5). Assuming $I_a = 1$, $I_p = 8$, $K_a = K_d = 0.3$ and authentication factor $\frac{1}{d^2}$, calculate intensity at each vertex (neglect specular reflection and symbols represent their conventional meanings).

(b) Explain the Phong Shading Technique. What are its advantages over Gouraud shading ?

(12+6)

5. (a) What are the problems specific to computer animation, and how can they be addressed ?

(b) Explain Raster Animations. How are they different from Keyframe Animations ?

(c) What are Computer Animation Languages ? List any two with their features.

(6+6+6)

6. (a) Explain the concept of back-face culling with suitable diagrams.

(b) What is spatial-partitioning representation ? How does it support efficient surface detection ?

(c) Describe how Octrees are used in visible surface determination. **(6+6+6)**

7. (a) What is a colour model ? Explain the process of converting RGB to CMY model with formulas.

(b) Write short notes on any three of the following :

(i) Warn Model

(ii) Bezier Curves

(iii) Intensity Attenuation

(iv) Binary Space Partitioning Trees

(v) Text Clipping **(9+9)**

- o 0 o -

SPACE FOR ROUGH WORK