

Code No: RT32032

**R13****SET - 1**

**III B. Tech II Semester Regular Examinations, April - 2016**  
**INTERACTIVE COMPUTER GRAPHICS**  
**(Mechanical Engineering)**

Time: 3 hours

Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. Answering the question in **Part-A** is compulsory  
3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- |   |    |  |      |
|---|----|--|------|
| 1 | a) | List various output devices used in computers.                           | [3M] |
|   | b) | Derive the transformation matrix for rotation about X&Z axis.            | [4M] |
|   | c) | Explain about window to viewport and viewport to window transformations. | [3M] |
|   | d) | What is a closed and open curve?   | [4M] |
|   | e) | Explain about visible surface detection.                                 | [4M] |
|   | f) | Explain about backface detection.  | [4M] |

**PART -B**

- |   |    |  |       |
|---|----|--|-------|
| 2 | a) | Explain the functioning of a Plasma display system.  | [8M]  |
|   | b) | Explain various hardcopy output devices.   | [8M]  |
| 3 |    | Explain flood fill algorithm with an example showing stack position at each step.          | [16M] |
| 4 |    | Demonstrate Sutherland-Hodgeman polygon clipping algorithm with an example.                | [16M] |
| 5 |    | Derive the blending functions for a Bezier surface 3x3.                                    | [16M] |
| 6 |    | Derive the transformation matrix to reflect an object about an arbitrarily selected plane. | [16M] |
| 7 |    | Write short notes on   |       |
|   | a) | Animation specification involving accelerations.   | [5M]  |
|   | b) | Motion specifications in animation.  | [5M]  |
|   | c) | Homogeneous coordinates.   | [6M]  |

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**PART -A**

- |   |  |      |
|---|--|------|
| 1 | a) Explain the difference between random scan and raster scan devices. | [3M] |
|   | b) Derive the transformation matrix for rotation about X&Y axis.       | [4M] |
|   | c) Explain the cohen-sutherland clipping algorithm.                    | [4M] |
|   | d) Explain about wireframe modeling.                                   | [4M] |
|   | e) Explain the need for concatenation of matrices.                     | [3M] |
|   | f) Discuss about motion specification.                                 | [4M] |

**PART -B**

- |   |  |       |
|---|--|-------|
| 2 | Explain various input and output devices.  | [16M] |
| 3 | Prove that a uniform scaling ( $S_x = S_y$ ) and a rotation form a commutative pair of operations but that, in general, scaling and rotation are not commutative operations.                 | [16M] |
| 4 | Compare the number of arithmetic operations performed in the Cohen-Sutherland and the Cyrus-Beck line-clipping algorithms for two different line orientations relative to a clipping window. | [16M] |
| 5 | Determine the blending functions for uniform, periodic B-spline curves of degree 3.  | [16M] |
| 6 | Write the depth buffer algorithm and demonstrate with an example.  | [16M] |
| 7 | Write short notes on   |       |
|   | a) Key frame systems.  | [5M]  |
|   | b) General computer animation functions.   | [5M]  |
|   | c) Parallel and perspective projections.   | [6M]  |

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3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- |   |  |      |
|---|--|------|
| 1 | a) Explain the functioning of CRT monitor.                                 | [4M] |
|   | b) Derive the transformation matrix for rotation about Y&Z axis.           | [4M] |
|   | c) Explain the liang barsky algorithm.                                     | [4M] |
|   | d) Write the shortcomings of Bezier curves.                                | [3M] |
|   | e) Derive the relation for rotation about XY plane, YZ plane and XZ plane. | [4M] |
|   | f) Explain about keyframe system.  | [3M] |

**PART -B**

- |   |  |       |
|---|--|-------|
| 2 | Explain in detail about any four input devices.  | [16M] |
| 3 | Show that transformation matrix for a reflection about the line $y = x$ , is equivalent to a reflection relative to the x axis followed by 2 counterclockwise rotation of $90^\circ$ .           | [16M] |
| 4 | a) Derive the window-to-viewport transformation equations <b>by</b> first scaling the window to the <b>SIZE</b> of the viewport and then translating the scaled window to the viewport position. | [16M] |
| 5 | Derive blending functions for a B-spline surface of degree 3x3.  | [16M] |
| 6 | Derive the transformation matrix for scaling an object by scaling factor S in a direction defined by the directional angles $\alpha, \beta, \gamma$ .  | [16M] |
| 7 | Write short notes:   |       |
|   | a) Generation of in-betweens key frames using linear interpolation   | [5M]  |
|   | b) Raster animation  | [5M]  |
|   | c) Back face detection.  | [6M]  |

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3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- |   |    |                                     |      |
|---|----|-------------------------------------|------|
| 1 | a) | Explain various input devices used. | [4M] |
|   | b) | Explain DDA algorithm.              | [4M] |
|   | c) | Explain about viewing function.     | [4M] |
|   | d) | Explain about CSG modeling.         | [3M] |
|   | e) | Explain about Z buffer algorithm.   | [4M] |
|   | f) | Explain about animation sequence.   | [3M] |

**PART -B**

- |   |  |  |
|---|--|--|
| 2 | Explain the functioning of any two monitors with applications.   | [16M]  |
| 3 | Show that transformation matrix, for a reflection about the line $y = -x$ , is equivalent to a reflection relative to the $y$ axis followed by a counterclockwise rotation of $90^\circ$ . | [16M]  |
| 4 | Carefully discuss the rationale behind the various tests and methods for calculating the intersection parameters $u_1$ and $u_2$ in the Cyrus-Beck line-clipping algorithm.                | [16M]  |
| 5 | Explain about any two shading algorithms in detail.  | [16M]  |
| 6 | Write scan line algorithm for visible surface detection and explain with an example.   | [16M]  |
| 7 | Write short notes on   |  |
|   | a)   | Animation specification implementing the acceleration-deceleration calculation. [5M] |
|   | b)   | Computer animation languages. [5M]   |
|   | c)   | 3-D clipping. [6M]   |

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