Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022**

**Subject Code:3150712 Date:06-01-2023**

**Subject Name:Computer Graphics**

**Time:10:30 AM TO 01:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | Write the differences between Random Scan display and Raster Scan display. | **03** |
| | **(b)** | Discuss various ways to represent a polygon mesh in brief. | **04** |
| | **(c)** | Draw and explain working of Cathod Ray Tube with diagram. | **07** |
| **Q.2** | **(a)** | Write limitations of DDA line drawing method. | **03** |
| | **(b)** | Write a note on Even-Odd rule. | **04** |
| | **(c)** | Derive all necessary formulas for Midpoint circle drawing algorithm. Write pseudo code for Midpoint circle drawing algorithm. | **07** |
| | | **OR** | |
| | **(c)** | Briefly explain scan line polygon filling algorithm. Explain the fields of edge table and criteria for adding and removing edge to active edge table. | **07** |
| **Q.3** | **(a)** | Write a note on 2D shearing. | **03** |
| | **(b)** | Obtain the matrix transformations for Reflection about the line y = x in 2 – dimensions. | **04** |
| | **(c)** | Consider the clipping window with Lower Left coordinate (1,2) and Upper Right coordinate (8,4). Clip a line P(-6,-1) and Q(-1, 4) using Cohen Sutherland line clipping algorithm. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain limitations of Sutherland – Hodgeman polygon clipping algorithm. | **03** |
| | **(b)** | Retrieve equations for the scaling factors to match the window to viewport in 2D viewing system. | **04** |
| | **(c)** | Prove that the multiplication of 2D transformation matrices for each of the following sequence of operations is commutative:<br>1) Two successive rotations<br>2) Two successive translations | **07** |
| **Q.4** | **(a)** | Write a short note on 3D translation. | **03** |
| | **(b)** | Compare parallel and perspective projection. | **04** |
| | **(c)** | List and explain the properties of B-spline curves. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Write a short note on 3D rotation. | **03** |
| | **(b)** | Compare interpolation spline and approximate spline. | **04** |
| | **(c)** | List and explain the properties of Bazier curves. | **07** |
| **Q.5** | **(a)** | Explain ambient light in brief. | **03** |

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|---|---|---|---|
| | **(b)** | Write a short note on YIQ color model. | **04** |
| | **(c)** | Prove that the transformation matrix for the 3D rotation about an arbitrary axis can be expressed as the composition of following seven individual transformations :<br>$R(\theta) = T^{-1}.Rx^{-1}(\alpha).Ry^{-1}(\beta).Rz(\theta).Ry(\beta).Rx(\alpha).T$ | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Explain the property of light using electromagnetic spectrum. | **03** |
| | **(b)** | Write a short note on RGB color model. | **04** |
| | **(c)** | Find out the 3D transformation matrix to rotate a given 3D object by an amount 60 about line passing from point(1,1,1) and the direction vector V=2i+2j+2k. | **07** |

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