

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE SEM-VI Examination-Nov/Dec-2011**

**Subject code: 160703****Date: 25/11/2011****Subject Name: Computer Graphics****Time: 10.30 am -1.00 pm****Total marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions & draw figures wherever necessary
3. Figures to the right indicate full marks.

- Q.1 (a) Briefly explain the any five computer graphics applications. 5  
 (b) Explain following terms 6  
     1. Persistence  
     2. Resolution.  
     3. Raster-Scan display system.  
 (c) What is frame buffer? How long would it take to load a 1280 by 1024 frame buffer with 12 bits per pixel if transfer rate is 1Mbps? 3
- Q.2 (a) What is aliasing? How to compensate the aliasing? Explain in detail. 6  
 (b) What are the limitations of DDA line drawing algorithm? Explain Bresenham's line algorithm. 8  
     OR  
 (b) Explain the property of circle and calculate the pixel position along circle path with radius  $r = 10$  centered on the origin using midpoint circle algorithm up to  $x=y$ . 8
- Q.3 (a) Prove that the multiplication of 2D transformation matrices for each of the following sequence of operations is commutative 8  
     1. Two successive rotations.  
     2. Two successive translations.  
 (b) What is window and view-port? Retrieve equations for the scaling factors to map the window to view-port in 2D viewing system. 6  
     OR
- Q.3 (a) Explain the Cohen Sutherland line clipping algorithm. 8  
 (b) What is 2D shear transformation? Covert the unit square to shifted parallelogram using x-direction shear transformation operation where parameter  $sh_x = \frac{1}{2}$  and  $Y_{ref} = -1$  and unit square dimensions are (0, 0), (1, 0), (0, 1) and (1, 1). 6
- Q.4 (a) Prove that transformation matrix for the rotation about an arbitrary axis can be expressed as the composition of following seven individual transformations 8  

$$R(\theta) = T^{-1} \cdot R_x^{-1}(\alpha) \cdot R_y^{-1}(\beta) \cdot R_z(\theta) \cdot R_y(\beta) \cdot R_x(\alpha) \cdot T$$
  
 (b) List the advantages of the B-splines over the Bezier splines and explain the B-spline curves properties. 6

OR

- Q.4 (a) Prove that general perspective projection transformation is obtain by the composition of shear and scaling operation and shows the matrix formulation for the both operations. 8
- (b) Explain the parallel and perspective projection techniques to project 3D object onto 2D view plane. 6
- Q.5 (a) Classify the visible surface detection algorithms and explain one of the image-space based algorithm. 8
- (b) Explain following color model 6
1. XYZ color model.
  2. RGB Color model.
- OR
- Q.5 (a) Explain the property of light using electromagnetic spectrum. Also explain following terms 8
1. dominant frequency
  2. purity
  3. luminance
- (b) Explain following color model 6
3. YIQ color model.
  4. CMY Color model.

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