

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. 1ST Semester Remedial Examination –July- 2011****Subject code: 710202****Subject Name: Advanced computer Graphics****Date:08/07/2011****Time: 10:30 am – 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.

- Q.1** (a) Which is more realistic, perspective projection or parallel projection? Why? Derive an equation for perspective projection on xy plane with centre of projection on positive z-axis at a distance d **07**
- (b) Briefly explain Z-buffer algorithm with its merits and demerits. Derive an equation to find Z at a given pixel (x, y) in Z-buffer algorithm. Also derive an equation to find Z_1 at pixel (x+1, y) and Z_2 at pixel (x, y+1). **07**
- Q.2** (a) Define orthographic parallel projection and oblique parallel projection. Derive a transformation matrix for isometric parallel projection. Find isometric parallel projection of unit cube placed at origin such that its three edges lie along x, y and z axis. **07**
- (b) Mention the advantages of B-spline over Bezier curve. Prove that C^2 continuity is inherent in B-spline. Blending functions for B-spline curve are
 $B_{03} = (1-t)^3/6$, $B_{13} = (3t^3 - 6t^2 + 4)/6$,
 $B_{23} = (-3t^3 + 3t^2 + 3t + 1)/6$
 $B_{33} = t^3/6$ **07**
- OR**
- (b) Define C^0 , C^1 and C^2 continuity. How it differ from G^0 , G^1 and G^2 continuity. Cubic Bezier curve segment is described by the control points P0 (1, 3), P1 (2, 8), P2 (12, 9) and P3 (10, b). Another curve segment is described by Q0 (a, 8), Q1 (9, c), Q2 (15, d) and Q3 (18, 5). Determine the value of a, b, c and d if there are C^0 , C^1 and C^2 continuity between two curve segments. **07**
- Q.3** (a) Define polyhedra. What is the necessary and sufficient condition for object to be a polyhedron? Mention the advantages of Winged-edge representation over other boundary representation methods. **07**
- (b) Explain three methods for polygon mesh representation. Also represent the object shown in Fig.1 using all three methods. **07**

OR

- Q.3 (a)** (1) Why half-toning technique is required? How it can be achieved? **03**
 (2) How do we find dominant wavelength and excitation purity of any color using CIE diagram? **02**
 (3) Give applications of YIQ color model. Why we prefer YIQ model rather than RGB in color image processing? **02**
- (b)** Briefly explain Aliasing. Also discuss anti-aliasing techniques. **07**
- Q.4 (a)** Compare image precision and object precision visible surface determination algorithms. Briefly explain techniques to make visible surface determination algorithms more efficient. **07**
- (b)** Discuss Back face Culling as visible surface determination algorithm. For the pyramid shown in fig 1 apply back face culling and find out visible surfaces. Assume oblique parallel projection with $\alpha = 45^\circ$ **07**
- OR**
- Q.4 (a)** Briefly explain ray tracing algorithm to determine visible surfaces. How does the efficiency of the algorithm can be improved? How does this algorithm solve the problem of aliasing? **07**
- (b)** What are the advantages of binary space partition (BSP Tree) algorithm over other list priority algorithm? With example explain BSP Tree construction. Also explain the BSP tree traverse algorithm to get a correct priority ordered polygon list. **07**
- Q.5 (a)** Briefly explain diffuse and specular reflection. Derive the illumination equation for both. What should be the effect in illumination equation if we consider light source attenuation? **07**
- (b)** Give illumination equation by considering effect of shadow and transparency. Briefly explain two pass Z-buffer shadow algorithm **07**
- OR**
- Q.5 (a)** Compare constant, phong and gouraud shading. Apply phong illumination and find out the intensity of polygonal surface $s = 4x + 3y - 4z = 0$, viewing direction $V = i + j + k$, $f_{att} = 1$, $K_s = 0.8$, $I_a = 1$, $I_p = 15$, $K_d = K_a = 0.15$ and $n = 2$ **07**
- (b)** Define rendering. Compare geometry based, image based and Point based rendering techniques. Define key frame, interpolation and morphing related to animation. **07**

