AML710 Computer Aided Design
Major Examination   Semester I– Session 2006-07

Time: 2 hrs   Marks: 60

Note: Answer all questions. There is a choice between Q.No. 6 and 7.

1. a) For the polygon given by its vertices (1,1), (3,1), (4,2), and (2,3) develop a single transformation matrix that
    i) Refleets about the line y=0
    ii) translates by –1 in both x and y direetions
    iii) rotates about the origin by 180°
    b) Discuss any two methods to obtain a two-point perspective transformation.
    c) A Bezier curve is given by

$$P(t) = \sum_{i=0}^{n} B_i J_{n,i}(t) \qquad \text{where } J_{n,i}(t) = \frac{n!}{i!(n-i)!} t^i (1-t)^{n-i}$$

Write and draw Bezier/Bernstein blending functions for n=1,2 and 3. Where docs the maximum value of these blending functions occur? Illustrate with examples.

$$(4+6+5)$$

2. a) A line parallel to y-axis with end points (0,0,0) and (0,3,0) is simultaneously translated 10 units along x-axis and rotated by 2π about x-axis. Determine a point at t-0.5, s=0.5 on the surface so generated.
    b) Compare a Bezier surface with B-spline surface with respect to convex hull, invariance to affine transformations and variation diminishing propcrties.
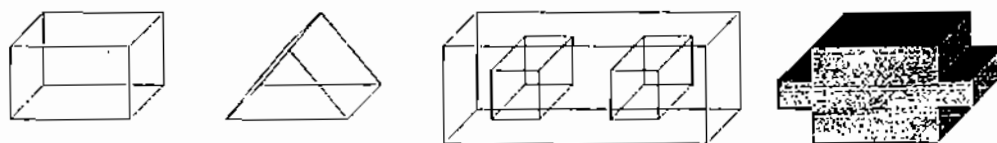
$$(6+3)$$

Fig. 1 (a) Cuboid   (b) Wedge   (c) 2 square thro' holes   (d) Stepped solid

3. Validate the solids in Fig. 1 using Euler-Poincare law.   (4)

4. a) What is set membership classification? Illustrate with an example
    b) Elaborate the concept of closure and regularized set opcrations   (4+4)

5. a) Give precise definitions of the following terms with respcct to a B-rep model:
    (i)Vertex (ii) Edge (iii) Face (iv) Loop (v) Body (vi) Genus
    b) Compare and contrast exact and faceted B-rep schcmes
    c) Illustrate with examples the following operations and also validate their transition states: (i) MEKBFL (ii) MFKLG

$$(3+3+4)$$

6. a) What is a binary tree? Describe how it is used as a CSG data structure
    b) Explain different tree traversal methods based on depth first paradigm.
    c) Create the CSG Model of the following solid

                                                              (3+5+6)
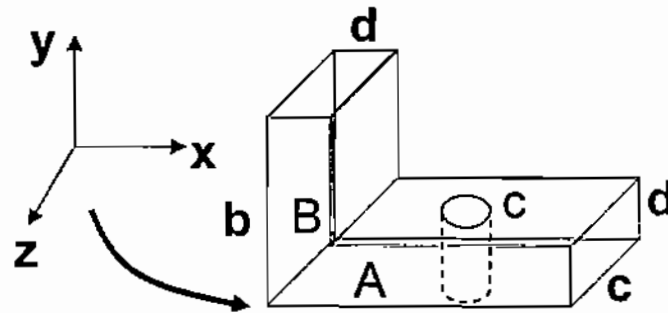
_____OR_____

7. a) Discuss the simple visibility algorithm for 2D clipping
    b) Write the salient features of Cohen-Sutherland end point coding

                                                              (7+7)