AML710 Computer Aided Design

Major Examination Semester II– Session 2007-08

Time: 2 hrs Marks: 60

Note: Answer all questions.

1. a) Derive a general transformation matrix for rotation about a point P(x,y).
b) Determine the matrix for reflection with respect to the plane passing through the origin and having a normal veetor $n=i+j+k$

(3+4)

2. a) A triangle with vertices (2 0) (0 2) and (-2 0) is transformed by $[T]=\begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$

. Find the area of the transformed triangle and verify your answer.

b) A surface is mapped from parametric to xyz space using the following relations:

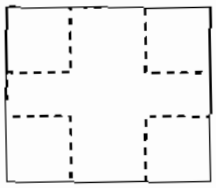
$x(u,w)=(u-w)^2 \qquad y(u,w)=u-w^2 \qquad z(u,w)=uw.; \quad 0\le u\le 1; 0\le w\le 1$

Determine the boundary curves and a point at $u = w = 0.25$.

(3+4)

3. a) What is a sweep representation? What are its advantages and limitations?
b) Discuss 2D clipping and simple visibility algorithm.

(3+4)



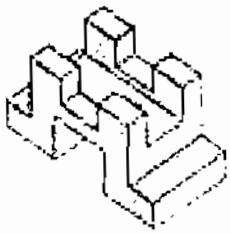


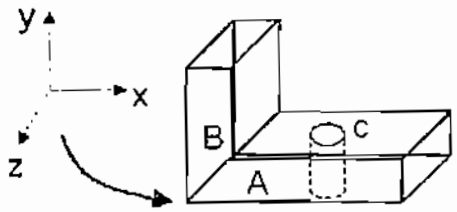
Fig. 1 (i) Cube with 2 Perpendicular holes of square cross section (ii)Cylinder with a separater (iii) Stepped object

4.a) State Euler-Poincare law. Mention different cases of this law.
b) Validate the solids in Fig. 1 using Euler-Poincare law (2+6)

5. a) Define a graph and distinguish it from a tree. What is a binary trec? Explain the tree traversal methods.
b) Discuss the salient features of Warnock algorithm for visible lines and surfaces.

(4+4)

6. Consider the solid shown in the figure below. Discuss representations of the solid using a) Half spaces b) Hyper patches (ASM).



(4+4)

7. Fill in the blanks with most appropriate answers

a) _____ is a convenient user defined eoordinate system that faeilitates geometric eonstruction, and the software does the necessary _____ before storing the data.
b) In set theory, $c(cP)$=_____ and $c(P \cap Q)$ =_____
c) The mathematical definition of eylindrical half-space is _____ and that of conical half space is _____.
d) In B-rep the eomplementary operation of **MME** is _____ and that of **ESQUEEZE** is _____.
e) The *indegree* and *outdegree* of the root node in an inverted binary tree are respectively _____ and _____.
f) In a CSG tree with *n* primitives, there are _____ Boolean operations for a total of _____ nodes.
g) The two essential parts of floating horizon algorithm are _____and _____.
h) The computational eomplexity in *object space* algorithms grows as _____ and the same in *images space* grows as_____.
i) _____initializes the database in Euler operations and its complement is_____
j) Topologically, a 1-manifold curve is homeomorhpic to _____ and a 2-manifold surface is homeomorphic to_____.
k) Sweep representation is called _____ modeling and is not _____ modeling shceme.
l) In 2D clipping the end point coding identifies _____ number of neighboring regions whereas in 3D case this becomes_____
m) The four types of cubie spline end conditions are _____, _____, _____and _____
n) For _____ knot values within the knot vector a _____ oeeurs in one of the basis functions.

(½ x30 blanks)

----------****----------