DHANALAKSHMI COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

ME 6501 - COMPUTER AIDED DESIGN

Unit-I

Part-A

1. Compare sequential engineering with concurrent engineering.

2. Explain the role of computers in design.

3. Why should we go for CAD?

4. Write short notes on clipping transformation.

5. What is homogeneous coordinate system?

6. What are the requirements of line drawing algorithms?

7. What are the functions of Computer Graphics?

8. What is automated drafting which is useful in design?

9. For the position vectors P_1[1 2] and P_2[3 4], determine the parametric representation of the line segment between them.

10. Define the term "transformation"

11. Define Translation, Scaling and rotation.

12. Derive the transformation matrix that rotates an object point about the origin by θ

13. What are the functions of an interactive graphic design workstation?

Part-B

1. What is design process? Draw flow diagram and explain its functions.

2. With an example, explain 2D and 3D transformations.

3. What is clipping? With the aid of an example, explain Sutherland -Cohen two dimensional clipping algorithm.

4. Explain DDA algorithm for drawing a straight line connecting two points with example.

5. Explain the CAD system architecture and write the benefits of CAD.

Unit-II

Part-A

1. What are synthetic curves?

2. What are Hermite curves?

3. How Hermite curves can be modified and write its limitations?

4. Explain how a Bezier curve is defined.

5. What are rational curves?

6. Give any four characteristics of B-spline curve.

7. What is Bernstein Basis function? How it alters the shape of a curve?

8. In geometric modeling, mention the major differences between the Bezier curve and the cubic spline curve.

9. Write the advantages of CSG and B-rep model.

10. Explain the Euler-Pontcare formula to verify the topology of valid solid models.

11. Write the general form of Bezier surface and B-spline surface.

12. Define C^0 and C^1 continuity

13. How do you ensure convex hull property in Bezier surface?

14. What do you mean by blending function?

Part-B

1. Explain B-spline curves as a effective method of generating curves. List the general characteristics of the B-spline curves.

2. Explain in detail how the **curves** are described mathematically in CAD.

3. (i) What are the various types of surfaces that can be created using a typical CAD software? Explain with examples.

   (ii) Derive the conditions for C^0 and C^1 continuity of cubic Bezier composite surfaces of two patches.

4. What is Boundary representation method (B-rep)? Explain in detail.

5. Explain in detail Constructive Solid Geometry (CSG) and write its advantages.

6. Explain the general characteristics of Hermite curves and Bezier curves.

7. . (i) What are the classes of boundary representation scheme? Show that they satisfy Euler equation of topology.

(ii) Construct a Binary tree of a CSG Model and indicate the types of model in the tree. Explain the types of primitives used in CSG model.

Unit-III

Part-A

1.What is rendering?

2. What are the major difference between object- space method and image-space method?

3. What are factors depends on the visibility of parts?

4. Give the various visibility techniques used for Hidden line removal.

5. Classify Hidden line/surface removal algorithms.

6. Define sorting and coherence.

7. What are shading enhancements?

8. What are the various color models used in typical CAD/CAM system?

9. What are the various animation techniques developed to simulate the mechanism?

10. What are the methods by which the hidden line or surface can be removed in 3-D Engineering Drawing?

11. What are the steps in general to be taken, in designing animation sequences?

12. With a sketch indicate the types of colors in a HSV color model.

13. With proper sketch how to compute **silhouette edges**.

14. Define diffuse reflection and specular reflection.

15. Briefly differentiate the methods of Gourand and Phong shading.

16. Write three color parameters.

Part-B

1. Explain the process of hidden line removal.

2. (i) Describe the "Sample Hidden Line" removal algorithm.

(ii) With proper sketch describe the Area oriented algorithm to identify the hidden line removal.

3. Explain the process of hidden surface removal.

4. What is Ray-tracing? Explain a simple opaque surface ray tracing algorithm in detail.

5.. What is rendering? Explain in detail.

6. What are color models? Describe how the purity and intensity value of color is defined in color models.

7. Describe the following: (a) Animation system with a videotape recorder. (b) Software architecture of animation systems

8. Compare CMY and RGB color model for engineering applications.

9.What is shading? What are the methods of shading?

Unit-IV

Part-A

1. What are the various types of geometrical tolerances?

2. How to control the shape, size and location of geometry using tolerance?

3. What are the methods used to compute the integral properties of solid models?

4. What is a location graph? How it will be used in assembly modeling?

5. What is meant by tolerance accumulation?

6. What is the Virtual Link pertaining to Mechanical Assembly?

7. What are the requirements of assembly modeling?

8. With block diagram explain the steps in generation of an assembly models.

Part-B

1. Explain the different assembly sequences in detail.

2. Explain the various representation schemes of storing assembly model in detail with examples.

3. What is D and T model? Explain how a typical D and T model can be generated?

4. Explain the worst case arithmetic method for tolerance analysis.

5. What is EDT model? Explain a EDT model of a typical part with neat diagrams.

6. Describe the mathematical basis of mass property calculations.

7. (i) What are the mating conditions for assembly ?

   (ii) With proper sketch explain for each condition.

8. What are the various properties of representation schemes used for creating solid models? Classify and explain them in detail.

Unit-V

Part-A

1. Explain any one method of exchanging modeling data among dissimilar CAD/CAM system

2. What are the advantages in customizing CAD system?

3. What is Graphics Kernal System [GKS] based on?

4. What is open GL?

5. Define data exchange standard.

6. What is CALS?

7. Define IGES and STEP.

8. Differentiate GKS and PHIGS.

Part-B

1. What is IGES exchange format? Explain the file structure of an IGES file with examples.

2. What is product modeling? Explain the concept of product data exchange using STEP in detail.

3. What is product life cycle? What is product data exchange? Explain some of the standards used in detail.

4. Explain the general structure of IGES.

5. Explain the general structure of PDES.

6. Discuss the requirements of product data exchange between dissimilar CAD/CAM systems.

7. Compare the shape based and the product data based exchange standards. Which has potential to support industrial automation? Why?

8. Explain the concept of GKS graphic standard in detail with the implementation.