

VALLIAMMAI ENGINEERING COLLEGE
DEPARTMENT OF MECHANICAL ENGINEERING
ME6501 COMPUTER AIDED DESIGN QUESTION BANK

UNIT – I

Part A

1. Explain the factors, which inhibit the use of a very high resolution and a large number of colours for display in the case of raster scanning display devices?
2. Give the general configuration of a CAD computer system.
3. In what ways CAD can help manufacturing activity? Discuss.
4. CAD helps in integrating CAM- Justify this statement.
5. How do you specify a plotter for graphics application?
6. Explain the four types of production.
7. Briefly describe the types of storage devices used in computers.
8. In design, what do you understand by synthesis and engineering analysis?
9. Explain how CAD helps to synthesize a product design and do engineering analysis for getting optimal design.
10. Briefly explain the conventional process of the product cycle in the conventional manufacturing environment.
11. What is the structure of a computing system?
12. What do you understand by the CPU?
13. List the advantages of computer aided design.
14. Bring out clearly the difficulties a design engineer has to face at each of the design stages if they are carried out manually.
15. What is meant by homogeneous coordinate?
16. Difference between sequential and concurrent engineering?
17. Write briefly on the secondary storage devices used in CAD System.
18. What are the functions of an interactive graphic design workstation?
19. Explain with the help of a neat sketch, how an image is generated on a computer terminal.
20. What is meant by clipping? Explain with the help of a diagram.

Part-B

1. Elaborate on the basic requirements that a CAD software has to satisfy.
2. Distinguish between modes of the design process and models of designs.
3. Describe the various database models which are generally used.
4. What are the differences between the sequential approach to the product development process and the concurrent engineering approach? Why should the latter be adopted?
5. A scaling factor of 2 is applied in the Y direction while no scaling is applied in the X direction to the line whose two end points are at coordinates (1, 3) and (3, 6). The line is to be rotated subsequently through 300, in the counter clockwise direction. Determine the necessary transformation matrix for the operation and the new coordinates of the end points.
6. What are the reasons for implementing a computer aided design system.
7. The vertices of a triangle are situated at points (15, 30), (25, 35) and (5, 45). Find the coordinates of the vertices if the triangle is first rotated 100' counter clockwise direction about the origin and then scaled to twice its size.
8. Describe the basic types of coordinate transformation in CAD, and then show how these may all be calculated using matrix operations through the homogeneous coordinate with an example of matrix. How may a general rotation transformation be expressed in terms of a combination of other transformation..
9. What is meant by Interactive Computer Graphics? Explain its various elements..
10. Briefly explain the Clipping and Line drawing with an example.

UNIT – II

Part A

1. For a cubic Bezier curve, carry a similar matrix formulation to a cubic spline.
2. Derive the cubic spline equations.
3. Given a point Q and a parametric curve in the Cartesian space, find the closest point P on the curve to Q. Hint: Find P such that (Q - P) is perpendicular to the tangent vector.
4. Explain the engineering application of cubic splines.
5. Derive the condition for C0 and C1 continuity in a cubic Bezier composite surface of two patches.
6. What are the types of surfaces that CAD/CAM systems use?

7. What is meant by Coon surface?
8. What do you understand by the form element method of geometric construction?
9. Specify the applications of this method of modeling in comparison to that of the variant type.
10. What are the limitations in utilizing the sweep method for geometric construction?
11. Distinguish between interpolation and approximation approaches used in design of curves.
12. Explain the basic curve fitting techniques.
13. Write on the importance of studying geometric modeling in CAD.
14. What are entities?
15. Explain the methods of defining lines, arcs and Circles in wire frame modeling?
16. Describe with the help of neat sketches the major surface entities provided by CAD/CAM systems.
17. How do you ensure convex hull property in Bezier surface?
18. Describe the effect of characteristic polyhedron over the resulting Bezier surface.
19. What do you mean by blending function? Explain reparametrisation of a surface.
20. What are the controlling points for generating curves.

Part B

1. Write a note on:
 - i. NURBS
 - ii. B-splines.
2. Discuss the modeling guidelines to be followed by the user while constructing a surface model as a CAD/CAM system.
3. Differentiate between Bezier and B-spline surface with reference to number of control points, order of continuity and surface normal.
4. Explain how a Bezier curve is defined.
5. What are the advantages of Bezier curves over cubic spline.
6. Explain how the curves are represented in Generic form
7. Explain how the curves are represented in Parametric form.

8. Describe the effect of characteristic polyhedron over the resulting Bezier surface.
9. What do you mean by blending function? Explain rep of a surface.
10. Briefly explain CSG and B-Rep of solid modeling techniques.

UNIT – III

Part A

1. What is color model?
2. What is color Gamut?
3. Differentiate Shades, Tints and Tones.
4. Distinguish between hidden line removal and hidden surface removal models.
5. State the salient features of RGB color space.
6. What is Morphing?
7. What is meant by Hidden-Line removal?
8. What is meant by bounding box test?
9. Write short notes on generic hidden-line algorithm.
10. Explain depth-buffer algorithm.
11. What is meant by gourmand shading.
12. Why phong shading is more computationally demanding than gouraud shading.
13. How scan-line coherence contributes to the efficient computation of hidden surface images.
14. What is Warnock's algorithm?
15. What are the light sources identified in shading models.
16. What is constant shading?
17. Explain shading enhancements.
18. Define computer animation.
19. What is real-time computer animation?
20. What are the steps followed by Slider-crank mechanism based on computer animation.

Part B

1. Explain briefly with sketches any six tests used for hidden line identification.
2. Explain briefly Phong shading and Gouraud shading.

- 3.Explain outline the steps required to generate a hidden-surface image using the depth-buffer approach and then comment on the relative merits of this approach compared with the scan-line algorithm.
- 4.Explain the surface algorithms for surface hidden removal of an object.
5. Write note on sample hidden line algorithms.
6. Explain the area oriented algorithm and Priority algorithm for hidden line removal.
7. Write note on Ray/Primitive intersection module of ray tracing algorithm.
8. Explain briefly RGB and CMY color model.
9. Write notes on Frame-Buffer animation and animation techniques with an example.
- 10.Explain key frame technique of computer animation with an example.

Unit – IV

Part A

1. Derive the equation that converts hsl coordinates into rgb coordinates
2. Apply the area oriented
3. Develop an algorithm that can enable the user to create and manipulate boundary model by using set operations.
4. Create the boundary model of the solid fillet. (nov 08)
5. It is desired to develop bounded primitives for a two- dimensional solid modeler based on the csg scheme. Plate (rectangular plate and triplate) and disc
- 6.primitives are to be developed. Find the mathematical definitions of these primitives. (feb 08)
7. Describe the various methods and operations required in each approach for the connecting rod. (feb 08)
- 8.What do you mean by geometric modeling?
- 9.Enumerate various solid-modeling techniques and compare them.(feb 07, ,mar 06,nov 06)
10. How do you represent a bracket with various primitives and sweep operations.
- 11 sketch with appropriate dimensions and explain the limitation. (nov 07)
12. Find the length of the common perpendicular to two screw lines
13. Find the center and major and minor radii of an ellipse
14. Find the intersection of two tangent lines at two known points on an ellipse

15. Find the radius and center of tangent to a line, passing through a point and with a given radius
16. Find the radius and center of tangent to a given circle and a given line with a given radius
17. Find the radius and center of tangent to two lines and passing through a point
18. Find the radius and center of passing through two points and tangent to a line
19. Find tangent to an ellipse at any given point on its circumference
20. Find tangent to an ellipse from a point outside the ellipse

Part B

1. Describe the Mass properties on CAD/CAM systems
2. Describe the assembly modelling with assembly tree and planning
3. Describe the different types of mating conditions
4. Describe bottom up assembly approach with example
5. Describe Top down assembly with example
6. Describe the Need of tolerance analysis with Representation
7. Describe WCS arithmetic method
8. Describe Worst case statistical method
9. Describe the monte carlo simulation
10. Give an example of how the centralized integrated database concept can help with the what-if situations that arise during the
11. Design process. (nov 08, jun 09)
12. Describe various commonly used primitives for solid modeling and explain the Boolean operations.

Unit – v

Part A

1. Give the requirements of product data exchange between dissimilar CAD/CAM systems
2. Compare IGES, PDES
3. Illustrate the scan-conversion process of a straight line in terms of pixel position.
4. Write the mathematical expression to scale a straight line about a fixed point.
5. Write any 2 properties of bezier curves.
6. Define 3d translation.
7. What is composite transformation?

7. What are the types of parallel projection?
8. What is color model?
9. What is color gamut?
10. Differentiate shades, tints and tones.
11. What is morphing?
12. Write the parametric equation of a plane surface defined by three points' p_0 , p_1 and p_2 .
13. Illustrate the difference between geometry and topology.
15. Sketch the four boolean operations of a block and a cylinder b.
16. Illustrate translational and rotational sweep models.
17. Distinguish between hidden line removal and hidden surface removal models.
18. State the salient features of rgb color space.
19. Briefly explain the top-down assembly approach.
20. What is the importance of wcs method in the assembly model?

Part B

1. Explain the following polyhedral object using b-rep elements and verify the euler equation for the same
 - (i) simple polyhedra.
 - (ii) polyhedral object a face may have loops.
 - (iii) objects with holes that do not go through the entire object.
 - (iv) objects have holes that go through entire objects.
2. Sketch the following feature operations using csg.
 - (i) extruded
 - (ii) revolved feature
 - (iii) chamber
 - (iv) loft feature
 - (v) pocket
 - (vi) shell
 - (vii) fillet
 - (viii) draft
 - (ix) rib and
 - (x) dimple.

3. Explain briefly with sketches any six tests used for hidden line identification.
4. List the differences and the similarities between nonlinear sweeps and lofts.
5. Describe how the variable radius fillet works. When is such one used?
6. Fig. 1 shows a pin and a block with their mcscs. The pin and the Instances to be assembled into the hole in the block. Use wcs and write The transformation matrices to merge the three instances of b into a.

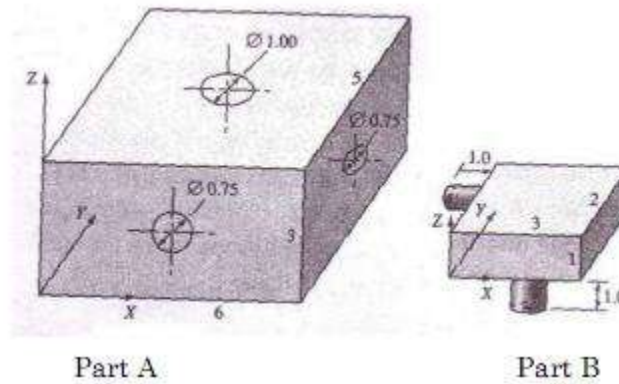


Fig. 1

7. Use the bottom-up approach to create the model of the universal joint Shown in fig. 2

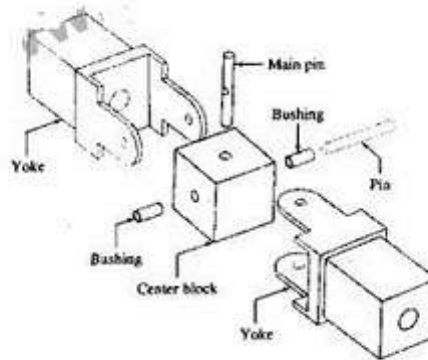


Fig. 15 (b)

Fig. 2

8. Describe the IGES methodology
9. Describe the pdes methodology
10. Compare various testing methods of iges processors