Chapter 1 -Introduction

1. What is graphic standard? Explain different CAD standards.
2. Write Bresenham's line algorithm. Determine intermediate pixels for line starting from (1, 1) to (8, 5).
3. Explain DDA algorithm for line generation with its limitations.
4. Write a Breshnham's algorithm for line having slop more than 45°
5. Explain Bresenham's algorithm for generation of line with flow chart.
6. Explain IGES graphic standard in detail with structure.
7. State different commercial CAD software available and explain the features of any two CAD softwarein detail.
8. State the various stages for a design process, in which various CAD tools can be used to improveproductivity.
9. Differentiate between Raster scan and vector scan displays.
10. State the various CAD software commercially available and explain the features used to modelHexagonal nut.
11. Explain interactive computer graphics.
12. Calculate the memory requirement for the 24-bit true color system for the 1024 x 1024 pixelresolutions.
13. State the various stages for a design process, in which various CAD tools can be used to improveproductivity.
14. Explain different types of coordinate systems available in CAD softwares.
15. Determine following for an 8-plane raster display with resolution of 1280 x 1024 and a refresh rateof 60Hz (non-interlaced):
    i. The size of graphical memory (refresh buffer memory).
    ii. The time required to display a scan line & a pixel.
    iii. The active display area of the screen if the resolution is 78 dpi (dots per inch).
16. Write steps required to plot a line whose slope is between 45^0 and 90^0, using Bresenham's algorithm.
17. Determine the pixels for a straight line connecting two points (2, 7) and (15, 10)

using Bresenham'salgorithm.

18. Using Bresenham's line algorithm, find the Pixel value position of line between points (1,5) and (4,10).

19. Using DDA algorithm, find the Pixel value position of line between points (2,10) and (6,5)
    Plot intermediate raster locations when scan converting a straight line from screen coordinate (2, 7)to screen coordinate (15, 10) using DDA algorithm

Chapter 4 - Geometric Transformations

1. Explain two dimensional geometric transformations in details. Also give transformation matrix foreach.
2. Explain orthographic and oblique projections in details with suitable sketch.
3. Write 3x3 transformation matrix for each of the following effects;
   Scale the image to be twice as large and then translate it 1 unit to the left.
   Scale x direction to be half as large and the n rotate anticlockwise by 90^0 about origin. (iii). Rotate anticlockwise about origin by 90^0 and then scale the x direction by half as large.(iv). Translate down 0.5 unit, right 0.5 unit, and then rotate anticlockwise by 45^0.
4. Derive the orthographic projection matrices for the Top view and Right Hand side view of a 3Dmodel.
5. Find reflection matrix, when the axis of reflection is given by the equation y=5x.
6. Write 2D transformation matrix for Scaling, Rotation and Translation.
7. Prove that $R(\theta 1).R(\theta 2) = R(\theta 1 + \theta 2)$ for geometrical transformation
8. Explain the concept of homogeneous coordinates and its use in representing geometricaltransformation.
9. Derive the matrix for orthographic projection matrices for the Top view and Right Hand side view ofa 3D model.
10. A triangle PQR has its vertices at P (0, 0), Q (4, 0) and R (2, 3). It is to be translated by 4 units in X direction, and 2 units in Y direction, then it is to be

rotated in anticlockwise direction about the newposition of point R through 90°. Find the final position of the triangle.

11. A triangle ABC has vertices as A (2, 4), B (4, 6) and C (2, 6). It is desired to reflect through an arbitrary line L whose equation is y=0.5X+2. Calculate the new vertices of triangle and show the result graphically.
12. A triangle ABC with vertices A (30, 20), B (90, 20) and C (30, 80) is to be scaled by factor 0.5 about apoint X (50, 40). Determine (i) the composition matrix and (ii) the coordinates of the vertices for a scaled triangle.
13. A triangle ABC with vertices A(0,0), B(4,0) and C(2,3) is Translated through 4 and 2 units along X and Y directions respectively and then Rotated through 90° in counterclockwise direction about thenew position of point C. Find:
    The concatenated transformation matrix and
    The new position of triangle
14. A point P is translated by (4,6,0) rotated about x-axis by 45º CCW and then rotated about z- axis by 30º CCW. Obtain the concatenated homogeneous transformation matrix and final coordinates of a point P.
15. Triangle ABC has its vertices at A (0, 0), B (0, 4) and C (3, 2). Zoom this triangle 3 times and then hangit considering a free body using hook at point C with origin.
16. A triangle ABC, having coordinate position of point A (15, 15) B (18, 12) and C (15, 20). Determinethe new vertex position if the triangle is :
    Scaled 0.5 times in X and 2 times in Y direction
    If mirrored about a line y = 4x + 12.
17. Triangle ABC has its vertices at A (4, 2), B (8, 2) and C (6, 5). It is to be rotated anticlockwise aboutpoint C through 90^0. Find the new position of triangle.
18. Compare result in case of 2D transformation of triangle ABC.
    Reflected about x-axis first followed by line y= -x
    Rotated about origin at 270^0.
    Coordinate of triangle ABC are: A (0, 0) B (3, 0) and C (0, 3).
19. Calculate the concatenated transformation matrix for the following operations performed in thesequence as below:
    21)Translation by 4 and 5 units along X and Y axis
    Change of scale by 2 units in X direction and 4 units in Y direction

Rotation by 60° in CCW direction about Z axis passing through the point (4, 4). Find new coordinates when the transformation is carried out on a triangle ABC with A (4, 4), B (8, 4)and C (6, 8).

20. A triangle PQR with vertices P (2, 5), Q (6, 7) and R (2, 7) is to be reflected about a line x = 2y – 6. Determine, (i) The concatenated matrix and (ii) The coordinates of the matrices for the reflected triangle.

Chapter 6 Engineering optimization:

1. Discuss applications of optimization in engineering.
2. What is optimization
3. Classify the optimization problem in detail?
4. Differentiate between adequate and optimum design. Also explain different types of equations that are used in 'Johnson's method of optimum design'.
5. What do you mean by primary and subsidiary design equation?
6. Draw the step by step flow chart for Optimum Design Procedure?
7. Explain the following with reference to optimization: i) Objective function ii) Constraints
8. What are various optimization techniques
9. Design the shaft diameter with objective to minimize weight. Consider following data:

Material	Density (Kg/m^3)	$S_{yt}(N/mm^2)$
Steel	7800	400
Alluminium alloy	2800	150
Titanium Alloy	4500	800

Length of the shaft = L = 0.5m Tensile force on shaft F = 3000N Factor of safety = 2