Unique Paper Code :	32341602
Name of the Paper :	Computer Graphics
Name of the Course :	B.Sc. (H) Computer Sc.
Semester :	VI

Duration: 3 Hours Maximum Marks: 75 Marks

Attempt any four questions.
All questions carry equal marks.
The complete answer to a question MUST be included in a SINGLE file.

Q1)
What do you understand by the statement: **aspect ratio = ¾** for a video monitor?

Consider two raster systems with resolutions **640×480** and **1280×1024**. How many pixels could be accessed in one second in each of these systems by a display controller that refreshes the screen at a rate of **60** frames per second? For each system, give the access time per pixel. Which of the above systems has better resolution? Justify your answer.

Q2)
Consider the triangle **ABC** with the following coordinates **A[2 6 1], B[4 9 1], C[4 9 1]**. Also consider a pair of lines **L** and **M** defined as: **L: y=1/2*(x+5)** and **M: x-y=0.** Using homogeneous coordinates, reflect the triangle **ABC** w.r.t. the line **L** and find the new coordinates. Next, rotate the transformed triangle by 90 degrees about the point of intersection **Q** of the lines **L** and **M**.

Q3)
Differentiate between Gouraud shading and normal vector interpolation shading. What is specular reflection in normal vector interpolation shading? What is the value of specular reflection parameter n_s for (i) dull surfaces and (ii) perfect reflectors?

How many different colour combinations can be generated using halftone approximations on a two-level RGB system with a **3×3** pixel grid?

Q4)
Consider the rectangular window **ABCD** and triangle **XYZ** with the following coordinates: **A(4, 1), B(12, 1), C(12, 7), D(4, 7)** and **X(8, 3), Y(14, 4), Z(12, 6)**. Clip the given triangle **XYZ** against the above rectangular window **ABCD** using the Sutherland Hodgman algorithm.

Also, clip the original triangle **XYZ** against the given rectangular window **ABCD** using Cohen Sutherland line clipping algorithm. While scan- converting the coordinates of an ellipse, what condition is tested to switch from region 1 to region 2.

Q5)
Distinguish between *orthographi*c and *oblique* parallel projections. Consider a unit cube with centre as origin and position vectors as given below:

(-0.5,-0.5, 0.5), (0.5,-0.5, 0.5), (0.5, 0.5, 0.5), (-0.5, 0.5, 0.5), (-0.5,-0.5,-0.5), (0.5,-0.5,-0.5), (0.5, 0.5,-0.5), (-0.5, 0.5,-0.5).

Translate the cube **5** units both in **X** and **Y** directions. Then perform single-point perspective projection on to the **Z=0** plane from a centre of projection at **Zc=10**. Also, calculate the vanishing point.

Q6)
Give one advantage and one disadvantage of the Z-buffer algorithm for visual surface determination.

Consider the equation of the given plane as **4x + 6y + 2z + 1 = 0**. Using incremental calculations, find the Z value at next pixel location **(x + 1, y)** and at next scan line location **(x, y + 1)**.

Derive the Basis Matrix for Hermite curves. Also, obtain its blending functions. Find the equation of the Hermite curve that passes through the starting point **(0,1)** and endpoint **(4,2).**