COMPUTER GRAPHICS
(INFO 3131)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) In Sutherland-Hodgman algorithm for polygon clipping, assume P (present point) lies inside the window and S (previous point) lies outside the window. Then, while processing through that window boundary, we should
(a) store the intersection point of line PS (S') only
(b) store the points P and S'
(c) store the point P only
(d) store the points S and S'

(ii) In vector displays beam is deflected from the endpoint to endpoint. This technique is called_____.
(a) Raster Scan (b) Random Scan
(c) Vector Scan (d) Conversion Scan

(iii) A cube of side 1 unit is placed such that the origin coincides with one of its vertices and the three axes run along three of its edges. The vertex diagonally opposite to (1, 1, 0) is
(a) (1,1,1) (b) (0, 0,1)
(c) (0,1,1) (d) (0, 1,0)

(iv) Reflection of a point about x-axis, followed by a counter-clockwise rotation of 90°, is equivalent to reflection about the line _____.
(a) x = -y (b) y=-x
(c) x=y (d) x + y = 1

(v) A rectangle is bound by the lines x = 0; y = 0; x = 5 and y= 3.
The line segment joining (1, 1) and (4, 4) if clipped against this window, will connect the points
(a) (0, 1) and (3, 3) (b) (1,1) and (3, 3)
(c) (1, 1) and (4,3) (d) none of the above

(vi) What will be the colour depth of an image if 6 variations of Red, 7 variations of Green and 9 variations of Blue are used to produce colours?
(a) 9 (b) 12
(c) 10 (d) None of these

(vii) A line connecting the points (1, 1) and (3,5) is to be drawn, using the DDA algorithm. Find the value of x and y increments.
(a) x-increment = 0.5 ; y-increment = 1
(b) x-increment = 1; y-increment = 1
(c) x-increment = 1 ; y-increment = 0.5
(d) none of the above

(viii) Find the incorrect statement(s).
(a) A perspective projection produces realistic views.
(b) A parallel projection gives realistic representation of 3-D objects.
(c) A perspective projection preserves realistic dimensions.
(d) Both (b) & (c).

(ix) If the endpoints of the line are P5 and P6; and the corresponding codes are 0001 and 0000; then which of the following is correct?
(a) The line is Partially Visible
(b) The line is Completely Visible
(c) The line is Completely Invisible
(d) This is an error

(x) CMYK colour model is also known as
(a) Additive Colour Model (b) Subtractive Colour Model
(c) Multiplicative Colour Model (d) Distributive Colour Model

Group – B

2. (a) Differentiate between different image tones. What is device independent colour model?

(b) Why television broadcasting agencies adapt interlacing?

(c) What is the difference between display device's resolution and image's resolution? If we keep the second one constant and reduce the first one, what will be the visual effect?

(3 + 2) + 3 + (2 + 2) = 12

3. (a) Given are the two point-coordinates (5,-4) and (-2, 4). Find out the pixels that you have to illuminate to draw a line between these points using Bressenham's Line Drawing Algorithm. Draw a graph to show the output.

(b) Describe Bressenham's Circle Drawing Algorithm. Why it is advantageous over Midpoint Circle Drawing Algorithm?

6 + (4 + 2) = 12

Group – C

4. (a) Prove or disprove that, "two successive rotations are commutative".

   (b) Discuss with illustration how the Scanline Polygon-filling Algorithm works.

   (c) Let there is a triangle having three vertices at (5,5,5), (1,10,5) and (10,1,5). Rotate the triangle by 45° counter-clockwise with respect to origin, parallel with Z axis.

3 + 6 + 3 = 12

5. (a) A triangle located at P(10,30), Q(40,40), R(40,30). Workout the transformation matrix which would reduce the triangle by half of its original size and rotate the resultant triangle by 90° clockwise with keeping the point Q static to its position. Find the vertices of the rotated triangle.

   (b) What are the different types of rotation that are possible to be applied on 3D environment? Give transformation matrices for each of them.

(6 + 3) + 3 = 12

Group – D

6. (a) Why normalization is required in viewing pipeline?

   (b) Given a window bordered by (1, 2) at the lower left and (16, 12) at the upper right, give the screen coordinates of a triangle with vertices (5, 10), (10, 10) and (5, 5) when mapped into a viewport with corners (100,100) and (400,200). Provide accurate illustrations of the window, viewport, and the untransformed and transformed triangles with your answer. Remember in screen coordinates y increases as you go down.

   (c) Explain vanishing point.

3 + 7 + 2 = 12

7. (a) Consider a window which is restricted between corner points (10, 20) and (110, 80). Applying Liang Barsky Line Clipping Algorithm, find out the accepted portions of the following line segments:
   (i) (120,100) to (120,0)
   (ii) (20,60) to (100,40)
   (iii) (-10,120) to (90,70)
   Illustrate your answer by showing both original and accepted line segments on the window.

   (b) What are the major advantages and disadvantages of Cohen-Sutherland line clipping algorithm?

9 + 3 = 12

Group – E

8. (a) What is Painter's Algorithm and how it works? Why is it named so?

   (b) Explain how Z-buffer algorithm works. Why in practice does the running time for the Z-buffer algorithm remain nearly constant as the number of polygons increases?

(4 + 2) + (4 + 2) = 12

9. (a) Describe how Scanline method for hidden surface detection and elimination work?

   (b) Describe the different Illumination models.

6 + 6 = 12

Department & Section	Submission Link
IT	https://classroom.google.com/c/MTI1OTk5MTkwOTUx/a/Mjc0MDUwNTY0NjI4/details