



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(IT)/SEPARATE SUPPLE/SEM-7/IT-703A/2011

2011

COMPUTER GRAPHICS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

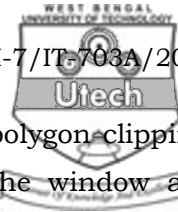
- i) Interlacing
 - a) refers to mixing shades on the graphics screen
 - b) refers to displaying alternative columns on the screen
 - c) refers to displaying alternative rows on the screen
 - d) is another term for refreshing the screen.



- ii) Oblique projection with an angle of 45° to the horizontal plane is called
- a) Cabinet projection b) Cavalier projection
- c) Isometric projection d) none of these.
- iii) The slope of a cubic Bezier curve at the start of the curve is controlled by
- a) first control point
- b) first two control points
- c) first three control points
- d) all four control points.
- iv) An object is viewed by using perspective transformation. The maximum number of principal vanishing points possible are
- a) 1 b) 2
- c) 3 d) infinite.
- v) Assuming that one allows 256 depth value levels to be used, how much memory a 512×512 pixel display require to store the Z-buffer ?
- a) 512 K b) 256 K
- c) 1024 K d) 128 K.



- vi) A circle, if scaled in only one dimension becomes a/an
- a) ellipse
 - b) parabola
 - c) hyperbola
 - d) remains a circle.
- vii) Backface removal algorithm is an example of
- a) object space method
 - b) image space method
 - c) combination of both
 - d) none of these.
- viii) Find the correct statement (s)
- a) A perspective projection produces realistic views
 - b) A parallel projection preserves realistic dimensions
 - c) A perspective projection preserves realistic dimensions
 - d) A parallel projection gives realistic presentation of 3-D objects.
- ix) Pixel phasing is a technique for
- a) shading
 - b) anti-aliasing
 - c) hidden line removal
 - d) none of these.



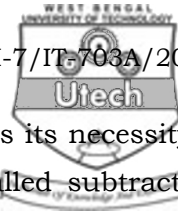
- x) In Sutherland-Hodgman algorithm for polygon clipping, assume P (present point) lies inside the window and S (previous point) lies outside the window. Then, while processing through the window boundary, we should
- a) store the intersection point of the line PS (S') only
 - b) store the points P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

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Indicate which pixels would be chosen by Bresenham's line drawing algorithm when scan converting a line from pixel coordinate $(1, 1)$ to pixel coordinate $(8, 5)$. Clearly state the formulas you have used.
3. Magnify the triangle with vertices $A(0, 0)$, $B(1, 1)$ and $C(5, 2)$ to twice its size while keeping $C(5, 2)$ fixed.
4. Derive the transformation matrix for mapping a point (x_w, y_w) defined in window to viewport location (x_v, y_v) .
5. Explain the methodology used in gourad shading.



6. What is meant by a colour model and what is its necessity ?
Why RGB is called additive and CMY is called subtractive colour model ?

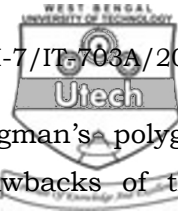
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Show that the composition of two rotations is additive.
b) What is homogenous coordinate ?
c) Reflect the diamond shaped polygon whose vertices are $A(-1, 0)$, $B(0, -2)$, $C(1, 0)$, and $D(0, 2)$ about
i) the horizontal line $y = 2$
ii) the vertical line $x = 2$
iii) the line $y = x + 2$ $3 + 2 + (2 + 2 + 6)$
8. a) Discuss midpoint circle drawing algorithm.
b) Using midpoint circle drawing algorithm find the pixels of a circle in the first octant whose radius is 8 unit. Take origin as the centre of the circle.
c) What are the differences between flood-fill and boundary-fill algorithm ?
d) What are the side effects of scan conversion algorithm ?

$6 + 4 + 2 + 3$



9. a) Discuss in brief the Sutherland-Hodgman's polygon clipping algorithm. What are the drawbacks of this algorithm ?
- b) A clipping window $ABCD$ is located as follows
 $A (100, 10), B (160, 10), C (160, 40)$ and $D (100, 40)$.
 Using Cohen-Sutherland's line clipping algorithm find visible portion of a straight-line between $P_1 (120, 5)$ and $P_2 (180, 30)$. (7 + 3) + 5
10. a) Derive the equation for a cubic Bezier curve. Hence find the basic matrix and blending functions of a cubic Bezier curve.
- b) What are the advantages of B -spline curve over Bezier curve ? Under what special circumstances, a Bezier curve can be thought of as a specific case of B -spline curve ? (6 + 2 + 2) + (3 + 2)
11. a) Discuss the back-face removal algorithm.
- b) Using the origin as the centre of projection derive the perspective transformation onto the plane passing through the point $R_0 (x_0, y_0, z_0)$ and having a normal vector $\vec{N} = n_1\hat{i} + n_2\hat{j} + n_3\hat{k}$.
 Use above result to obtain perspective transformation matrix when centre of projection is at (a, b, c) .
- c) Differentiate between cabinet and cavalier projection.

5 + 8 + 2



12. Write short notes on any *three* of the following : 3×5

- a) Perspective anomalies
- b) Z-buffer algorithm
- c) 3D general axis rotation
- d) Spline curve.

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