CS/B.Tech (IT)/(Supple)/SEM-7/IT-703A/09
COMPUTER GRAPHICS (SEMESTER - 7)



1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | | |

CS/B.Tech (IT)/(Supple)/SEM-7/IT-703A/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009

COMPUTER GRAPHICS (SEMESTER - 7)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

.....

Head-Examiner/Co-Ordinator/Scrutineer

S–53053 (31/07)

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COMPUTER GRAPHICS

SEMESTER - 7

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GROUP – A

(Multiple Choice Type Questions)

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

i) In Cohen-Sutherland line clipping algorithm the region code of two end points of a line are 1010 and 0011. Then the line is

a) completely inside the window

b) completely outside the window

c) parallel to one window edge

d) none of these. ☐

ii) The value of tan α for cabinet projection is

a) 2 b) $\frac{1}{2}$

c) 1 d) none of these. ☐

iii) In RGB colour model, the colour coordinate for white is given by

a) (0, 0, 0) b) (1, 1, 1)

c) (0·5, 0·5, 0·5) d) none of these. ☐

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iv) Which of the following is not an additive transformation ?

a) Rotation b) Translation

c) Scaling d) Both (a) and (b). ☐

v) The mirror image of the point P (12, 8), when it is reflected *w.r.t.* the line $y = -x$ is

a) (8, 12) b) (– 8, – 12)

c) (– 12, 8) d) none of these. ☐

vi) The lookup table technique ..... the number of intensity levels.

a) decreases b) increases

c) removes d) gives no side effect on. ☐

vii) If (x, y, w), $w \neq 0$, is a point in the homogeneous coordinate system then its equivalent in the two dimensional system is

a) (x, y, 1) b) (x, y, 0)

c) (x / w, y / w) d) (x, y, $x - y$). ☐

viii) The property that Bezier curve do not have is

a) local control b) variation diminishing property

c) axis independence d) none of these. ☐

ix) The Z buffer algorithm

a) finds the largest depth value Z

b) finds the smallest depth value Z

c) finds the average of the frame buffer

d) calculates the intensity at (x, y). ☐

x) Two curves are said to be connected at a point with first order continuity if

a) both curves simply meet at that point

b) the tangents to both the curves at that point is equal

c) the curvatures to both the curves at that point is equal

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d) there is a discontinuity of both the curves at that point.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 ∞ 5 = 15

2. Derive an illumination model using a single point source, ambient light and specularly reflected light. 5

3. What is meant by a colour model and what is its necessary ? Why RGB is called additive and CMY is called subtractive colour models ? 2 + 3

4. Develop the back-face removal algorithm. 5

5. Describe *Z*-buffer algorithm. 5

6. Compare Phong's shading with Gourad's shading techniques. 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 ∞ 15 = 45

7. a) Define and classify graphical output devices. Mention basic characteristic of each category and show their mode of operations with the help of neat block diagrams. 6

b) A CRT monitor has 320 ∞ 200 pixels. It works in a non-interlaced fashion at a rate of 60 Hz. Consider horizontal and vertical retrace times of 5 μs and 10 μs respectively. Assuming no overscanning determine the time available to generate each pixel. 6

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c) Define refreshing and blankening of a CRT monitor. 3

8. a) Illustrate how would you generate pixel points for a line segment joining points (0, 0) with (5, 4) using Bresenham's line generation algorithm. 5

b) Consider Bresenham's circle generation algorithm, in which, for a pixel (x_i , y_i) already been scan converted, the next pixel to be scan converted is either $(x_i + 1, y_i)$ of $(x_i + 1, y_i - 1)$, depending on whether the expression $t_i^2 = y_i^2 - y^2$ is less than $s_i^2 = y^2 - (y_i - 1)^2$ or not, where $(x_i - 1, y)$ satisfies equation of the circle $x^2 + y^2 = r^2$. Assuming $d_i = t_i^2 - s_i^2$, show that

i) $d_{i+1} = d_i + 4x_i + 6$, if $d_i < 0$

ii) $d_{i+1} = d_i + 4 (x_i - y_i) + 10$, if $d_i < 0$. 5

c) Outline a suitable method of scan converting the ellipse $x^2 / a^2 + y^2 / b^2 = 1$. 5

9. a) Why homogeneous co-ordinate system is so called ? 5

b) Show that rotation and scalling operations are commutative. 5

c) What is inverse transformation ? Deduce the inverse of the transformation : 5

$$T = \begin{bmatrix} a & b & o \\ c & d & o \\ o & o & 1 \end{bmatrix}$$

10. a) Given a straight line $y = 0.5x + 2$; and position vector of the vertices of a traingle as (2, 4, 1), (4, 6, 1) and (2, 6, 1). How will you obtain coordinates of the vertices of this triangle, on reflection with respect to the given straight line ? You may keep the find result in a matrix multiplication form. 6

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b) Outline the basic steps necessary to reflect a figure in space with respect to an arbitrary plane. 5

c) What are homogeneous coordinates ? Why are they useful ? 4

11. a) Obtain a viewing transformation matrix that maps a window whose lower left corner is at (1, 1) and upper right corner is at (3, 5) onto a viewport that has lower left corner at (0, 0) and upper right cornet at (0.5, 0.5). 6

b) What can be concluded about the visibility of a line segment in Cohen Sutherland line clipping algorithm, if both end point codes are not 0000 ? 4

c) With the aid of a suitable example, illustrate the working principle of Sutherland-Hodgmon polygon clipping algorithm. 5

END

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