BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Bachelor of Science (Honours) in Computer Science

Course Name - Computer Graphics

Course Code - BCS502B

(Semester – 5)

Time allotted: 3 Hours   **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)   10 x 1 = 10

1. *Choose the correct alternative from the following*

(i)   The total number of pixels put on for the line starting at (1, 1) and ending at (12, 7) would be

   a. 7   b. 11

   c. 12   d. More than 12

(ii)   In 2D graphics if S_1 and S_2 are two scaling matrices and T_1 and T_2 are two translation matrices then

   a. $S_1 \times S_2 = S_2 \times S_2$ b. $S_1 \times T_1 = S_2 \times T_2$

   c. $T_2 \times S_2 = T_1 \times S_1$ d. $S_1 \times T_2 = T_2 \times S_1$

(iii) If 8 bits are used to store intensity information of a pixel, how many intensity levels can be displayed?

   a. 2^8 b. $2^8 - 1$

   c. $2^8 + 1$ d. 2^{8+1}

(iv)   On a monochromatic monitor, the frame buffer is known as

    a. Display file   b. Pixmap

    c. Refresh buffer   d. Bitmap

(v)   In the generation of circle by Bresenham's Algorithm, it is simple to generate

    a. All octants   b. One octant first and others by successive reflection

    c. One octant first and others by successive rotation   d. One octant first and others by successive translation

(vi)   Which of the following technique is used in Mid-point subdivision algorithm?

    a. Binary search   b. Bubble sort

    c. Linear search   d. Sequential search

(vii)   What will be the value of initial decision parameter if we intend to draw a line between A(3,6) and B(4,9) using Bresenham's algorithm?

    a. 6   b. 5

    c. 3   d. none of these

(viii)   Which of the following points lies on the same side as the origin with reference to the line $3x + 7y = 2$?

    a. (3, 0)   b. (1, 0)

    c. (0.5, 0.5)   d. (0.5, 0)

(ix)   A point P(5,1) is rotated by 90 degrees about a pivot point (2,2). What is the coordinate of new transformed point P' ?

    a. (3, 5)   b. (5, 3)

    c. (3, 4)   d. (1, 5)

(x)   The parametric representation of the line segment between the position vectors P1 (2, 3) and P2 (5, 4) is given as

    a. $x(t)= 2+7t$, $y(t) = 3+7t$ b. $x(t)=2+10t$, $y(t) = 3+12t$ $0 \le t \le 1$
        $0 \le t \le \infty$

    c. $x(t)= 2+3t$, $y(t)=3+t$ d. $t(x, y) = 14t$ $0 \le t \le 1$
        $0 \le t \le 1$

Group – B

(Short Answer Type Questions)   3 x 5 = 15

Answer any *three* from the following

2.   Derive the Bresenham's line drawing algorithm mathematically.   5

3.   Explain what you understand by 4-connected and 8-connected method. Write pseudocode for flood fill algorithm to fill any closed area.   5

4.   Derive the transformation matrices for 2D rotation about origin.   5

5.   Suppose a raster system with resolution 640 by 480. How many pixels could be accessed per second in this system if the display controller refresh rate is 60 Hz? What is the access time per pixel in this system?   5

6.   Explain shadow mask methods for colour monitor.   5

Group – C

(Long Answer Type Questions)   3 x 15 = 45

Answer any *three* from the following

7.   (a)   A triangle is defined by (20, 12), (14, 18) and (30, 40) Find the transformed coordinates after the following transformations :
      i) 90° rotation about (5, 6).
      ii) Reflection about line $y = -x$.

           8

    (b)   What is projection? Compare parallel and perspective projection.   7

8. (a) A Bezier curve is to be drawn by P1(40, 40), P2(10, 50) , P3(60, 70) & P4(60, 0) where P1 and P2 are two endpoints. Calculate the coordinates of the points on the curve corresponding to the parameter t= 0.2, 0.4, 0.6. Show the rough sketch of the curve with the coordinates of various points on it.   8

   (b) Define orthographic and oblique projection. Establish the relationship between orthographic projection coordinate (x,y) and oblique projection coordinate (xp,yp) on the view plane from a point (x, y, z) (Assume necessary parameters).   7

9. (a) Derive the Bresenham's circle drawing algorithm mathematically.   9

   (b) Define persistence and aspect ratio.   6

10. (a) Clip the following polygon with respect to the rectangle $P_1P_2P_3P_4$ step-by-step.
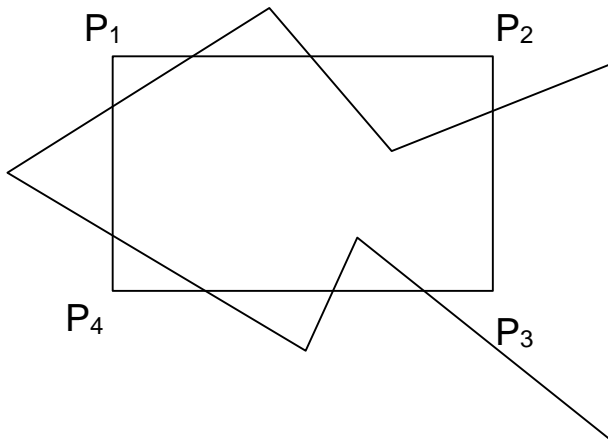
   10

   (b) Discuss briefly about interlacing.   5

11. (a) Clip the following polygon with respect to the rectangle $P_1P_2P_3P_4$ step-by-step.
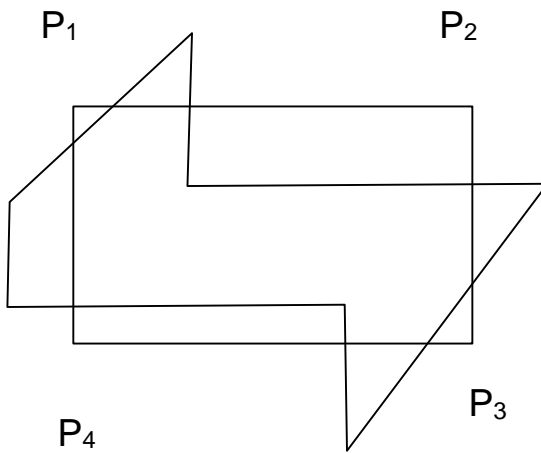
   10

(b) Prove that transformation matrix formed when the rotation angle is θ multiplied by the transformation matrix formed when rotation angle is $(-\theta)$ is equal to identity matrix. 　　　　　　　　　　5