CS/MCA/Even/Sem-4th/MCA-402/2015

WEST BENGAL UNIVERSITY OF TECHNOLOGY

MCA-402

GRAPHICS AND MULTIMEDIA

Time Allotted: 3 Hours   Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as
practicable. All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1.   Answer *all* questions.   10×1 = 10

   (i) One of the disadvantages of the raster scan display is
       (A) it can not display color image
       (B) surfaces may not be displayed
       (C) a line can not be easily erased
       (D) it can not take advantage of technological research and mass production of the television industry

   (ii) A B-spline curve is called a uniform B-spline
       (A) when the spacing between the adjacent knot values is constant
       (B) when the distance between the adjacent control points is constant
       (C) when the curve is infinite times differentiable
       (D) none of the above

   (iii) The format for storing digital audio in multimedia applications is
       (A) JPEG   (B) TIFF   (C) WAV   (D) BMP

4130   1   Turn Over

(iv) A line is to be drawn on screen starting from (1, 1) and ending at (50, 60). The total number of pixels that would be put ON or shown on the screen would be

(A) 49   (B) 50   (C) 59   (D) 60

(v) A Bezier curve is drawn with the control points P, Q, R, and S. To alter the shape of the curve one needs to shift

(A) both P and S   (B) both Q and R

(C) all the control points   (D) any control point

(vi) If R = 100, G = 100, and B = 100, then intensity will be

(A) 50   (B) 100   (C) 255   (D) 110

(vii) A image with 300 ppi would contain

(A) 90000 pixel   (B) 89000 pixels

(C) 5184 pixel   (D) none of these

(viii) Studies on visual perception of the eye have shown that the human eye is less sensitive to color information than to the brightness information. This limitation can be exploited to transmit reduced color information as compared to brightness information by a process called

(A) Compression   (B) Huffman encoding

(C) Chroma sub-sampling   (D) None of these

(ix) Clipping Algorithm which follows "Divide and Conquer" strategy is

(A) 4 – bit algorithm

(B) Cyrus-Beck algorithm

(C) Midpoint subdivision

(D) Cohen-Sutherland algorithm

(x) When we want to fill in an area that is not defined within a single color boundary then we use

(A) Boundary fill algorithm   (B) Flood fill algorithm

(C) Zone fill algorithm   (D) None of these

GROUP B
(Short Answer Type Questions)
Answer any *three* questions. $3\times5 = 15$

2. (a) What is affine transformation? 1

(b) What is the necessity of homogeneous coordinate system with respect to 2D transformation? 1

(c) What is the general form of 2D transformation matrix in homogeneous coordinate system and hence describe the purposes of different sub-matrices of it. 1+2

3. (a) Show that two successive translations in composite transformation is additive. 2

(b) Derive the relationship among the rotations R_θ, $R_{-\theta}$ and R_θ^{-1} in 2-D 3

4. (a) Describe eight-point symmetry of a circle using suitable example. 1

(b) Trace the Bresenham's circle drawing algorithm to determine first 5 points of the circle $x^2 + y^2 = 25$. 4

5. Describe the use of <FRAMESET> tag with example. 5

6. What is aspect ratio? Consider three different raster systems with resolutions of 640×480, 1280×1024 and 2560×2048. What size of frame buffer is needed for each of these systems to store 12 bits per pixel? How much storage is required for each system if 24 bits/ pixel are to be stored? 1+4

GROUP C
(Long Answer Type Questions)
Answer any *three* questions. $3\times15 = 45$

7. (a) Identify two main advantages of Bresenham's line drawing algorithm for the scan conversion of lines over DDA. 2

(b) Derive the Bresenham's line drawing algorithm to draw a straight line from (x_s, y_s) to (x_e, y_e) with $|m| \geq 1$, where m is the slope of the line. 8

(c) What is meant by "aliasing" in computer graphics? 1

(d) Obtain the image of the triangle ABC whose vertices are $A = (-6, 4)$, $B = (-3, -2)$ and $C = (3, 0)$ when it is rotated about the point $(-1, -1)$ through an angle of $\dfrac{\pi}{2}$. 4

8. (a) Define World coordinate system and device coordinate system. What is the need to introduce normalized device coordinate system? 2

   (b) Apply the Cohen-Sutherland line-clipping algorithm to clip the line P1P2 with P1(10, 30) and P2(80, 90) against the window ABCD with A(20,20), B(90, 20), C(90, 70), and D(20,70). 5

   (c) How can we determine if a point is inside a polygon or not in terms of scan line polygon filling? 2

   (d) What is the structure of Sorted Edge Table (SET) in scan line polygon filling? 2

   (e) How does the z-buffer algorithm determine hidden surfaces? 4

9. (a) Derive the basis matrix for Hermite Spline curves and hence give the blending function. 5

   (b) Explain geometric continuities and parametric continuities. What is the condition for smoothly joining curve segments? 5

   (c) Two cubic Bezier curves, with control points P0, P1, P2, P3, and Q0, Q1, Q2, Q3 respectively, are joined together at P3 = Q0. What must be true for them to meet with C1 continuity? 5

10. Discuss the digitization principle of audio. What are the different components of multimedia system? Compare hypertext and hypermedia with suitable example. What are the different animation principles? 3+3+4+5

11. Explain the following in respect of digitization of analog signals with suitable example: 2+2+2+4+5
    (i) Sampling rate
    (ii) Sampling resolution
    (iii) Quantization error
    Discuss about inter-frame and intra-frame compressions relating to MPEG.
    Write an HTML script that creates a thumbnail image that is linked to the full size image.