KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B.Sc.
Year : III

Course : COMP 342
Semester: I

Exam. Roll No.: Time: 30 mins. F.M. : 10

Registration No.: Date : MAR 05 2018

SECTION "A"
[20×0.5=10marks]

Tick (√) the best answer(s) or fill in the blanks with most appropriate word/phrase.

1. Producing graphical representations for scientific, engineering, and medical data sets and process are generally referred as _____
   [ ] Computer Art [ ] Education and Training
   [ ] Presentation Graphics [ ] Visualization

2. In mid point circle drawing algorithm, if the present pixel position is (X_k, Y_K) of 1st octant and decision parameter $\mathbf{P_k = 0}$, then the selected pixel is:
   a. (X_{k+1}, Y_K)
   b. $(X_{k+1}, Y_K - 1)$
   c. $(X_{k+1}, Y_K + 1)$
   [ ] a or b [ ] a or c [ ] a only [ ] b only

3. While drawing an ellipse with $\mathbf{r_x = 8}$ and $\mathbf{r_y = 6}$ and center at origin using Mid-point algorithm, the initial decision parameter $\mathbf{P2_0}$ for region-2 is _____
   [ ] -213 [ ] -214 [ ] -215 [ ] -216

4. Which of the following statements holds true for interlaced display system:
   a. effective technique for avoiding flicker
   b. used for slower refresh rate
   c. vertical retrace occurs twice in a single frame
   [ ] a & b [ ] a & c [ ] b & c [ ] a, b &c

5. What does the pixel register of a video controller holds?
   [ ] Memory address of a pixel in frame buffer
   [ ] Value of X-axis of a pixel
   [ ] Intensity value of a pixel
   [ ] Value of Y-axis of a pixel

6. In advanced raster graphics system with attached display processor, the video controller has the direct access with:
   [ ] CPU [ ] Frame buffer
   [ ] System memory [ ] Display Processor

7. Rotate a line A(0, 0) , B(1,0) by $\mathbf{45^0}$ about the origin _____
   [ ] (0,0) (√2/2, √2/2) [ ] (0,0) (0, √2)
   [ ] (0,0) (-√2/2, √2/2) [ ] (0,0) (√2/2, √2/2)

8. What is the use of homogeneous coordinates and matrix representation?
[ ] To treat all 3 transformations in a consistent way [ ] To scale
[ ] To rotate [ ] To shear the object

9. The 2D rotation and scaling is commutative if:
a) Sx = Sy
b) $\theta = n\Pi$
c) $\theta = 45^0$
[ ] a & b [ ] a & c [ ] b & c [ ] a, b &c

10. While Clipping the line using Cohen-Sutherland line clipping algorithm with endpoints A (1, -2) B (3, 3) against a window (-3, 1, 2, 6), what will be the outcode of a given line?
[ ] (0110, 0010) [ ] (0100, 0010) [ ] (0101, 0100) [ ] (0001, 0100)

11. What problem might arise, if the viewing coordinate is directly converted to device coordinate in 2D viewing?
[ ] device dependent [ ] problem in image orientation
[ ] inappropriate window- viewport specification [ ] inefficient clipping

12. 3D shearing transformation is used for:
a) Modifying object shapes
b) conversion between left handed and right handed system
c) obtaining general projection transformations in 3D viewing
[ ] a & b [ ] a & c [ ] b & c [ ] a, b &c

13. In cabinet projection, the lines perpendicular to the viewing surface are projected at _____ in their length.
[ ] no change [ ] 1/2 [ ] 1/4 [ ] 3/4

14. If the depth of the position (x, y) has been determined to be **Z** (Calculated depth value from the 3D plane equation), then the depth **Z'** of the next position (x+1, y) along the scan line is obtained by adding _____ constant ratio with **Z**.
[ ] B/C [ ] –B/C [ ] A/C [ ] –A/C

15. The Scan-line method is unable to process if:
a) Number of Polygon surfaces increases
b) Polygon Surface cut through each other
c) Polygon surface cyclically overlap each other
[ ] a & b [ ] a & c [ ] b & c [ ] a only

16. Which of the following characteristics hold true for point source of light?
a. Rays follow radially diverging paths
b. Size of light source is small compared to object in the scene
c. Light source is closer to the scene
[ ] a & b [ ] a & c [ ] b & c [ ] a, b &c

17. What value of $\mathbf{n_s}$ (Specular reflection parameter), results illuminated intensity from the 3D surface similar to diffuse reflection while simulating specular reflection?
[ ] 100 [ ] 50 [ ] 2 [ ] 1

18. Which deficiencies are resulted by Gouraud shading algorithm:
a. Intensity discontinuities
b. Mach bands formation
c. Formation of anomalous
[ ] a & b [ ] a & c [ ] b & c [ ] a, b, & c

19. If the CMY color triplet is (0.5, 0.1, 0.2), what is its resulting RGB color triplet?
[ ] (0.5, 0.3, 0.1) [ ] (0.5, 0.9, 0.8)
[ ] (0, 0.1, 0.2) [ ] (0, 0,0)

20. In which step of animation sequence detailed drawing of the scene at certain time is done?
[ ] Storyboard layout [ ] Object definitions
[ ] Key-frame specifications [ ] Generation of in-between frames

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Level : B.Sc.
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Time : 2 hrs. 30 mins.

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F.M. : 40

SECTION "B"
[6 Q.×4=24 marks]

Attempt any SIX questions.

1. Department of Computer Science and Engineering is working on Active Learning project (***Active learning is a process whereby students engage in activities that promote higher order learning skills like analysis, synthesis, and evaluation. Project and Problem-based learning are active and learner-centered methodologies***), you as a student of Computer Graphics, Describe what will be your contribution in this project? [4]

2. Describe vector display system with suitable block diagram and example? How much time is spent scanning across each row of pixels during screen refresh on a raster system with a resolution of 1280 by 1024 and a refresh rate of 50 HZ? [2.5+1.5]

3. Is simultaneous shearing (in both directions) the same as a shearing in one direction followed by a shearing in another direction? Identify transformation matrix $\mathbf{M}_L$ which reflects an object about a line **L** ***(Make necessary assumptions and no matrix multiplication is required).*** [2+2]

4. What are the advantages of Liang Barsky over Cohen Sutherland line clipping algorithm? Clip the line ***L1 (1, -2, 3, 3)*** against the rectangular window ***R (-3, 1, 2, 6)*** using Liang Barsky line clipping algorithm? [1+3]

5. Differentiate between object space method and image space method? What are the advantages of introducing A-buffer method over Z-buffer method? Write an algorithm for Scan line hidden surface detection method? [1+1+2]

6. Differentiate between local illumination model and global illumination model? Explain Specular reflection with supporting mathematical calculations? [2+2]

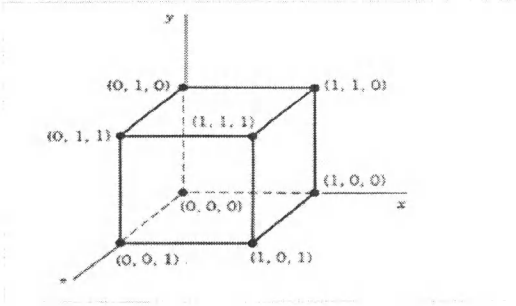
7. Write Short notes on: [2+2]
   a. YIQ Color model
   b. Computer Animation Language

SECTION "C"
[8Q.×2=16 marks]

Attempt any TWO questions.

8. What are the advantages of DDA approach of line drawing compare to direct approach? Derive all the required decision parameters for plotting the Region 1 of an ellipse using Mid-point algorithm? Digitize a circle with center at origin and radius 5? [1+5+2]

9. Explain 3D viewing pipeline with suitable example to illustrate the transformation performed in each stage? Find the new coordinates of a unit cube (given below) $\mathbf{90^0}$ rotated about an axis defined by its endpoints A(2,1,0) and B(3,3,1) [3+5]



10. A) What are the two different ways of removing a Mach band that might be formed in Gouraud rendering technique? Explain Phong rendering technique with supporting mathematical calculation? [1+3]

B) Express $\boldsymbol{R(\theta)}$ in terms of Shearing and scaling transformations? Write the general form of a scaling matrix with respect to a fixed point $\boldsymbol{P(h,k)}$? [2+2]