

KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.E.
Year : III

Course : COMP 342
Semester : II

Exam Roll No. : Time: 30 mins.

F. M. : 10

Registration No. :

Date :

SECTION "A"
[20Q. × 0.5 = 10 marks]

Mark [×] against the most appropriate option.

- Which application of computer graphics uses 3D modeling packages, drawing program, and CAD software?
 Computer Aided Design Visualization
 Computer Art Graphical user interfaces
- If slope (m) of the line is greater than or equal to 1, then the successive value of X and Y are computed as
 $X_{k+1} = X_k + 1; Y_{k+1} = Y_k + m$ $X_{k+1} = X_k + 1/m; Y_{k+1} = Y_k + 1$
 $X_{k+1} = X_k - 1; Y_{k+1} = Y_k - m$ $X_{k+1} = X_k - 1/m; Y_{k+1} = Y_k - 1$
- While drawing a Region-1 of an ellipse with $r_x = 8$ and $r_y = 6$ and center (200, 300) using midpoint algorithm, the initial decision parameter P_{10} is _____.
 436 -364 404 -332
- If we want to resize a 1024×768 image to one that is 640 pixels wide with the same aspect ratio, what would be the height of the resized image?
 853 854 480 768
- In raster scan system, the video controller performs
a. Basic Refreshing operations
b. Retrieve multiple pixel values from the refresh buffer
c. Mix the frame-buffer image with an input image from other input device
 a & b a & c b & c a, b & c
- How much time is spent scanning across each row of pixels during screen refresh on a raster system with resolution of 1280×1024 and a refresh rate of 60 frames per second?
 0.068 Sec 0.058 Sec 0.078 Sec 0.048 Sec
- The Cartesian coordinate position (10, 4) can be represented with homogeneous coordinate _____ triple.
 (5, 2, 2) (20, 8, 2) (10, 4, 2) (5, 2, 1)
- In **X-direction** shear relative to the line $y = y_{ref}$, with shearing factor Sh_x and Sh_y in X and Y direction, the transformed **X- coordinate** will be _____.
 $x + Sh_x * y$ x
 $x + Sh_x (y - y_{ref})$ $sh_y * (y - y_{ref}) + y$
- The rotated coordinate of a point A (1, 1) about the point P (-1, -1) is _____.
 $A'(-1, 2\sqrt{2} - 1)$ $A'(1, \sqrt{2} - 1)$ $A'(-1, 2\sqrt{2})$ $A'(0, \sqrt{2})$

KATHMANDU UNIVERISTY
End Semester Examination
May/June, 2022

Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : COMP 342
Semester : II
F.M. : 40

SECTION "B"

[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions. *Question number 1 is compulsory.*

1. The Research Lab of Biotechnology in Kathmandu University is working for developing genetically modified Mushroom seed, they have been doing a research in their Lab for 2 years and collected volume of data that shows how different factors (identified during research) impact the production of mushroom and if the proper measures(identified during research) taken will increase the mushroom productivity, they are planning to present their work in World Agriculture Conference, but they are struggling to find a better way to present their work in 2 minutes. You as a student of computer Graphics which application will you use and what will be your approach to identify different components to solve this problem? (Make assumptions as needed) [4]
2. Suppose we have a computer with 32 bits per word and a transfer rate of 1 MIPS (million instructions per second). How long would it take to fill the frame buffer of a 300 dpi (dot per inch) laser printer with a page size of 8.5×11 inches? Differentiate between Raster and Random display system? Describe the random display system architecture? [2+1+1]
3. Describe one application of composite transformations in computer graphics with illustration? Determine the homogeneous transformation matrix for reflection about the line $y = 2x - 6$ [Matrix multiplication not needed] [2+2]
4. What is the difference between window and viewport? Apply Liang Barsky line clipping algorithm for calculating the saved portion of line from (2, 7) to (8, 12) in a window ($xw_{min} = yw_{min} = 5$ and xw_{max} and $yw_{max} = 10$) [Show the entire steps as per the algorithm]? [1+3]
5. Why is it easier to locate hidden surfaces when parallel projection is used? Describe Scan line method for hidden surface detection technique with suitable example and also list its advantage and similarity with depth buffer algorithm? [1.5+2.5]
6. What is the difference between the local illumination and Global illumination? Describe diffuse reflection with supporting mathematical calculations and also write the equation that shows the surface lighting effects produced by the various terms, if we place more than one point source in a scene? [1.5+2.5]
7. Write Short notes on: [2+2]
 - a. YIQ Color model
 - b. Ray Tracing

SECTION "C"

[2Q. \times 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Derive all the required decision parameters and write an algorithm for plotting the one region of an ellipse starting from $(R_x, 0)$ where R_x is the radius across x-direction of an ellipse and R_y is the radius across y-direction of an ellipse using Midpoint algorithm? Digitize a line with end points A (10, 10) and B (16, 14) using Bresenham line drawing algorithm? [6+2]
9. Calculate the transformation coordinates of a unit cube for a cavalier projection with $\phi = 45^\circ$ (use homogeneous coordinate)? Derive 3D composite transformation matrix for rotating a 3D object about an arbitrary axis using homogeneous coordinate? (*Make necessary assumptions*) [Matrix multiplication not needed] [3+5]
10.
 - a. Explain intensity interpolation rendering techniques with supporting mathematical relation and also write its advantages over intensity interpolation rendering technique? [4]
 - b. An object is defined with respect to a coordinate system whose units are measured in feet. If an observer's coordinate system uses inches as the basic unit, what is the coordinate transformation used to describe object coordinates in the observer's coordinate system? (1 feet = 12 inches)? Derive the general form of the composite transformation matrix for rotation about a point $P(h, k)$ by θ° in homogeneous coordinate? [2+2]