

KATHMANDU UNIVERSITY  
End Semester Examination  
August/September, 2017

Mark Scored:

Level : B. E./B. Sc.  
Year : III

Course : COMP 342  
Semester : I & II

Exam Roll No. : Time: 30 min

F. M. : 10

Registration No.:

Date

SEP 13 2017

SECTION "A"  
[20 × 0.5=10 marks]

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

- In which application of computer graphics, automobile simulator is used to test drivers' reaction for optimizing vehicle design to maximize traffic safety?  
 Computer-Aided Design                       Visualization  
 Education and Training                       Image Processing
- Along the circle section from  $y = 0$  to  $x = y$  in the first quadrant, we can take unit steps \_\_\_\_\_ in over this octant.  
 positive X direction                       Negative X direction  
 positive Y direction                       Negative Y direction
- While drawing line with end point (20, 10) and (30, 18) using bresenham algorithm, the initial decision parameter  $P_0$  is \_\_\_\_\_  
 -4                       6                       16                       -2
- In RGB monitors with raster graphics system having 24 bits per pixel in the frame buffer. How many different voltage settings for each electron gun are available?  
 17 million                       256                       128                       512
- In basic video-controller refresh operations the raster-scan generator unit generates:  
a. Horizontal and vertical deflection voltages                      b. Values for X and Y registers  
c. Values of Pixel Register  
 a & b                       b & c                       a only                       a, b & c
- What is RLE is?  
 Scan conversion  
 storing lookup table  
 mixing frame buffer image with an input image from camera  
 image compression
- Rotate the line with vertices A (1, 1) and B (5, 2) by  $90^\circ$ , about the point P (1, 1). What is/are the coordinates of rotated line?  
 (2, 2) and (5, 2)                       (-1, 1) and (-2, 5)                       (1, 1) and (0, 5)                       (1, 1) and (5, 2)
- Where will be the reflection of point (X, Y) lies, if we are performing a reflection relative to an axis perpendicular to the *xy plane* and passing through the coordinate origin?  
 (X, -Y)                       (-X, Y)                       (Y, X)                       (-X, -Y)
- The 2D rotation and scaling is commutative if :  
a)  $S_x = S_y$                       b)  $\theta = n\pi$                       c)  $\theta = 45^\circ$   
 a & b                       a & c                       b & c                       a, b & c

10. What will be the region code for the line with endpoints (1, -2, 3, 3) against rectangular clipping window (-3, 1, 2, 6) in Cohen-Sutherland line clipping algorithm?  
 (0000)(0010)     (0110)(0010)     (0100)(0000)     (0100)(0010)
11. In Sutherland-Hodgeman Polygon Clipping algorithm, if first vertex is inside the window boundary and second vertex is outside the window boundary, what is added in the output list?  
 Intersection point & first vertex     First vertex  
 Intersection point     Nothing
12. Which of the following 3D transformation technique doesn't consider view plane while undergoing 3D transformation?  
a. Reflection    b. Rotation    c. Scaling    d. Translation  
 a & b     b & c     c & d     a, c & d
13. In which type of projection, the lines perpendicular to the viewing surface are projected at one-half their length?  
 Axonometric     Cabinet     Cavalier     Perspective
14. In scan-line method the surface is an overlapping surface if:  
a) Surface flag of one surface is turned ON  
b) Surface flag of two surfaces are turned ON  
c) Surface flag of two surfaces are turned ON and Surface flag of one surface is turned OFF  
 a & b     a & c     b & c     a, b & c
15. If the depth of position (x, y) has been determined to be z, then the depth z' of next position (x, y+1) can be obtained by adding constant \_\_\_\_\_ in existing value of z.  
 A/C     -A/C     B/C     -B/C
16. The Intensity of specular reflection depends on:  
a. Material properties of surface    b. Angle of incidence  
c. Intensity of ambient light  
 a & b     a & c     b & c     a, b & c
17. What is the expression for evaluating total diffuse reflection?  
  $K_d I_l (N \cdot L)$       $K_a I_a + K_d I_l (N \cdot L)$       $K_a I_a$       $K_s I_l (V \cdot R)^{ns}$
18. In flat Shading are performed if :  
a. Object is a polyhedron and is not an approximation of an object with a curved surface  
b.  $(N \cdot L)$  is constant over the surface  
c.  $(V \cdot R)$  is constant over the surface  
 a & b     a & c     b & c     a, b, & c
19. The color of an light is largely determined by its diffuse reflection coefficient. If  $K_d = (0.8, 0.4, 0)$  and the light is blue, what is the color of the object?  
 Red     Green     Blue     Black
20. Which steps of animation sequence defines the motion sequence as a set of basic events that are to take place?  
 Storyboard layout     Object definitions  
 Key-frame specifications     Generation of in-between frames

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SECTION "B"

[6 Q. × 4 = 24]

Attempt *ANY SIX* questions.

1. What do you understand by Computer Graphics? The Research group of Kathmandu University has developed an IOT (Internet of Things) device for monitoring the water level of rivers, presently they are facing a problem to effectively monitor the data provided by the device, you as a student of Computer Graphics, which application of computer graphics will you use and what will be your approach for solving this problem? [1+3]
2. In architecture of raster display graphics system, does video controller have a direct access to Monitor and what are the main functions of video controller? How much time is spent scanning across each row of pixels during screen refresh on a raster system with resolution of 1280 by 1024 and refresh rate of 60 frames per second? [2+2]
3. Why are homogeneous coordinates used for transformation computations in computer Graphics? The reflection along the line  $y = x$  is equivalent to the reflection along the x-axis followed by counter clockwise rotation by  $\theta$  degrees. Find the value of  $\theta$ ? [1+3]
4. Find the window-to-viewport coordinate transformation which uses a circle of **radius 5 units** and center **(1, 1)** as a window and circle of radius  $\frac{1}{2}$  and center  $(\frac{1}{2}, \frac{1}{2})$  as a viewport? Clip the line **L1 (-4, 7, -2, 10)** against the rectangular window **R (-3, 1, 2, 6)** using Liang-Barsky line clipping algorithm? [2+2]
5. What two steps are required to determine whether any given points  $P_1(x_1, y_1, z_1)$  obscure another point  $P_2(x_2, y_2, z_2)$ ? What were the advantages of using A-buffer method over depth buffer method? Describe Scan line method for hidden surface detection technique with suitable example? [1+1+2]
6. What is global illumination model? Differentiate between point source and distributed source of light? Describe specular reflection with supporting mathematical calculations? [1+1+2]
7. Write Short notes on:  
a. CMY Color model [2+2]  
b. General Computer Animation Functions

SECTION "C"

[2 Q. × 8 = 16]

Attempt *ANY TWO* questions.

8. Describe the basic principle of Bresenham algorithm for drawing 2D geometrical shapes? Derive all the required decision parameters for plotting the **region-1** of an ellipse using midpoint algorithm? Digitize the **region-2** of an ellipse with  $r_x=8$  and  $r_y=6$  and center at origin. [2+ 6]

9. Explain general 3D transformation pipeline, from modeling coordinates to final device coordinates with suitable example? Derive the composite transformation matrix for rotating a 3D object about an arbitrary axis (*make necessary assumptions*)? [3+5]
10. a. Differentiate between phong shading and Gouraud shading? Suppose point  $P_1$  with intensity  $I_1$  is on scan line  $Y_1$  and point  $P_2$  with intensity  $I_2$  is on scan line  $Y_2$ . Find an incremental formula to computer intensity values  $I'$  for all the scan lines between  $P_1$  and  $P_2$  using linear interpolation in the y direction? [2+3]
- b. Magnify the triangle with vertices  $A (0, 0)$ ,  $B (1, 1)$ ,  $C (5, 2)$  to twice its size while keeping  $C (5, 2)$  fixed? [3]