International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. in CSE Semester Final Examination, Spring 2019
Course Code: CSE 4735 Course Title: Computer Graphics
Total marks: ***50*** Time: ***2:30*** hours

[Answer any ***two*** questions from **Group-A** and any ***three*** questions from **Group-B;** Separate answer script must be used for Group-A and Group-B.]

Group-A

1. a) Define normalization transformation and workstation transformation. 2
   b) Let X be the rectangular window whose lower-left corner is at L(-2,1), and upper right corner is at R(2,6). Find the region codes for the endpoints of the lines AB, CD, EF. Where the coordinates are A(-1,5), B(3,8), C(-2,3), D(1,2), E(-2,5), F(-4,8) using Cohen-Sutherland algorithm. If the line is clipping the candidate, find the intersection points. 5
   c) Describe in brief the Sutherland-Hodgman algorithm for clipping polygons. 3

2 a) Describe 3D translation, rotation, and scaling. 3
   b) Write a 3-D rotation matrix about x, y, and z-axis. Show that the order of rotation does not perform the same result. 3
   c) A pyramid defined by A(0,0,0), B(1,0,0), C(0,1,0) and D(0,0,1) is rotated 45 degree about the line L that has the direction V=J+K and passing through point C(0,1,0). Find coordinates of the rotated figure. 4

3.a) What do you understand by composite transformation? 3
   b) Let $S_x = \frac{VX_{max} - VX_{min}}{WX_{max} - WX_{min}}$ and $S_y = \frac{VY_{max} - VY_{min}}{WY_{max} - WY_{min}}$ 3
   Now express window-to-viewport mapping in the form of a composite transformation matrix.
   c) Find the normalization transformation that maps a window whose lower-left corner is at (1, 1) and upper right corner is at (3, 5) onto i) a viewport that is the entire normalized device screen and ii) a viewport that has , corner at (0, 0) and upper right corner (1/2, 1/2). 4

Group-B

4. a) Explain mathematical description of parallel projection and perspective projection. 3
   b) Describe prospective anomalies. 3
   c) The rectangle ABCD is projected onto XY plane and the coordinates are: A(0,0,0), B(1,0,1), C(1,1,0), D(0,1,0). Find the projected image using the standard perspective transformation of a rectangle with i) d=1 and ii) d=10, where d is the distance from the view plane. 4

5. a) Define the wireframe model. Explain the advantages and disadvantages of the wireframe model. 3
   b) Why are hidden-surface algorithms needed? 2
   c) Describe in brief any algorithm for the hidden surface problem. 3

d) Explain the method to calculate the depth value for a 3D object. Why is it so vital in the hidden surface algorithm? 2

6. a) What are the local illumination model and global illumination model? Briefly describe. 3

b) What are the anti-aliasing techniques to remove the lighting effect from a ray-traced image? 3

c) Given points: P1(1,2,0), P2(3,6,20), P3(2,4,6), and a viewpoint C (0,0,-10), determine which points obscure the others when viewed from C. 4

7. a) Describe the ways of representing the polygonal net model. 3

b) What do you know about the hidden surface? Why is it needed to be eliminated in graphics? 3

c) What is the difference between a vector and a ray? Describe three principle vanishing points. 4