University of Chittagong

Department of Computer Science and Engineering

7th Semester B.Sc. (Engg.) Examination-2020

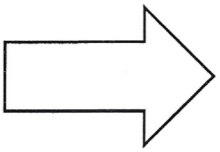
Course Code: CSE-715 Course Title: Computer Graphics

Total marks: 52.5 Marks Time: 4.00 hours

[Answer any ***three*** questions from each of the ***Group-A*** and ***Group-B***. A separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

Group-A

1. a)	Which discipline describes producing and synthesizing digital images? Justify your answer.	3
b)	Can a 5 by 3½ inch image be presented at 3½ by 4 inches without introducing geometric distortion?	2
c)	How a digital image can be formed from object definition?	1.25
d)	Why it is necessary to maintain a standard aspect ratio? If an image has a height of 2 inches and an aspect ratio of 1.5, what is its width?	1+1.5
2. a)	What do you mean by subtractive color model? Give an example. Why do many color printers use a separate black ink cartridge?	1+1
b)	If we use direct coding of RGB values with 10 bits per primary color, how many possible colors do we have for each pixel?	1.5
c)	If we want to cut a 700×700 sub-image out from the center of a 900×800 image, what are the coordinates of the pixel in the large image that is at the upper-right corner of the small image?	2.75
d)	Could you fill the following figure using the Flood Fill algorithm with 8-connected pixels? Justify your answer.	2.5



3. a)	Find the CMY coordinates of a color at (0.1, 0, and 0.5) in the RGB space.	1
b)	Show raster locations while drawing a line using the DDA algorithm from (1, 1) to (5, 8).	3.75
c)	Find raster locations using Bresenham's algorithm when scan-converting a line from pixel coordinate (0, 0) to a pixel coordinate (8, 5).	4
4. a)	Perform a 90° rotation of rectangle A (1, 1), B (1, 2), C (2, 2), and D (2, 1) about the point B (-1, -1).	4.25
b)	Magnify the following triangle with vertices A (1,1), B (2, 1), and C (2, 2) to twice its size while keeping B (2, 1) fixed.	3.5
c)	Show 8-way symmetry of a circle.	1

Group-B

5. a) Find the workstation transformation that maps the normalized device screen onto a physical device whose x extent is 0 to 199 and y extent is 0 to 639 where the origin is located at the lower-left corner. 2

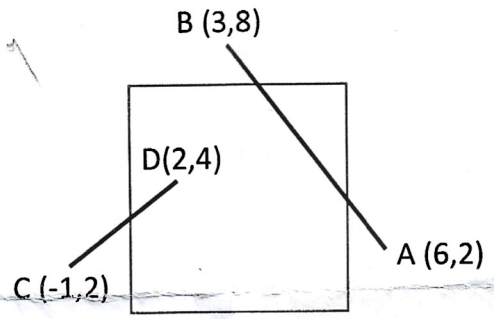
b) Find the normalization transformation that maps a window whose lower-left corner is at (1, 1) and upper right corner is at (2, 2) onto a viewport that has a lower-left corner at (0, 0) and upper right corner (1/2, 1/2). 2.75

c) Briefly explain the Cohen Sutherland algorithm. 3

d) Differentiate between the geometric and coordinate transformation. 1

6. a) While capturing and displaying images we need to keep in mind that monitor sizes may vary from one system to another. To resolve this issue, what kind of coordinate system is required and why? 1

b) 4



Find the region codes for endpoint A(6,2), B(3,8), C(-1,2), and D(2,4). Clip the line segments AB and CD using the Cohen-Sutherland algorithm. *(Assume $X_{min}=1$, $X_{max}=5$, $Y_{min}=1$, $Y_{max}=7$)*

c) Identify the convex and concave polygons from the below figures and justify your selection. 2

(i) (ii) (iii) (iv)

d) What do you mean by perspective foreshortening and vanishing point? 1.75

7. a) Show the conditions to identify whether a point locates the right or left side of a line segment. 2.25

b) Define positively and negatively oriented convex polygon. 3.5

c) Demonstrate 3D rotation matrices. 3

8. a) Distinguish between perspective and parallel projections? Which projection is used by the architects and engineers? 3

b) Draw the diagrams of isometric, diametric, and trimetric projections. 2.25

c) Given points P_1 (1, 2, 0), P_2 (3, 6, 20), and P_3 (2, 4, 10) and a viewpoint C(0, 0, -10), determine which points obscure the others when viewed from C. 3.5