**BANGLADESH UNIVERSITY OF PROFESSIONALS**
**Military Institute of Science and Technology**
**B.Sc. in Computer Science and Engineering**
**Student Group : Earned Credit Hour >108, Final Examination (Fall) : Dec 2020**

**Subject: CSE-413, Computer Graphics**

**Total: 2.00 hours** **Full Marks: 180**
**Section A : 1.00 hour** **Section A : 90**

**INSTRUCTIONS:**

a. Use **SEPARATE** answer scripts for each section.
b. **Question – 1 and Question – 4 (Viva Voce)** in **Section A** are compulsory.
c. Answer any **OTHER ONE** question from this section **(From Q - 2 & Q - 3)**.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
f. **Symbols** used have their usual meanings.

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**SECTION-A**

**Question – 1 (Compulsory)**

a. Given a square $PQRS$ (Figure 1) where the coordinate of point P is (a,b) and the side of the PQRS square is 4 units. You need to transform this square into another square $P'Q'R'S'$ as shown in Figure 1 by performing scaling, rotation and translation operations. [Necessary figure is attached at the end] **26**
   i) Mention the order/sequence of the operations.
   ii) Determine the final composite matrix.
   iii) Find out the coordinates of the resultant square.
   Assume that, a=last 2 digits of your student ID+20
   b=Your CSE batch number +2

b. A ray having direction e falls on a plane $x + y + z + 10 = 0$ and reflects in direction r. The incident ray is given by $\vec{e} = \hat{\imath} + \hat{\jmath}$. Find out the direction of the reflected ray r and angle between incident ray e and reflected ray r. **10**

**Question – 2**

a. Using Sutherland-Hodgeman polygon clipping procedure, show the steps for clipping polygon 'ABCDEFGHI' in Figure 2. Note that, if your student ID is even, clip the polygon based on top and left edges only; otherwise clip the polygon based on bottom and right edges only. **15**
   Also mention the disadvantages of this algorithm.
   [Necessary figure is attached at the end]

b. Generate all the points of Quadrant-I of a circle having radius 12 units and center (-x,y) using an efficient rasterization algorithm of a circle and explain the reason of choosing the algorithm. Also, illustrate the application of symmetric property of the circle for drawing it using the algorithm. **12**
   Assume that, x=last 2 digits of your student ID +2
   y=Your CSE batch no +1

c. Suppose, you have applied a scan conversion algorithm on a line. After completing the scan conversion process, some form of distortions is being observed in rasterize line. Now, briefly describe the possible form of distortions that may happen due to the operation. **9**

**Question – 3**

a. Using Liang Barsky line clipping procedure, clip the lines PQ and RS as shown in Figure 3 [attached at the end] . **15**

b. Determine the final transformation matrix by reflecting the triangle whose vertices are A(2,4), B(5,7) and C(8,5) about the line 3y=2x-5 and also find out the final coordinates of the resultant triangle. **12**

c. Suppose, you have been given an image area (Figure 4) for coloring it using a region filling algorithm. Which algorithm will you choose to perform this operation? Briefly explain your reason(s). [Necessary figure is attached at the end]. **9**

**Question – 4 Viva Voce (Compulsory)** **18**

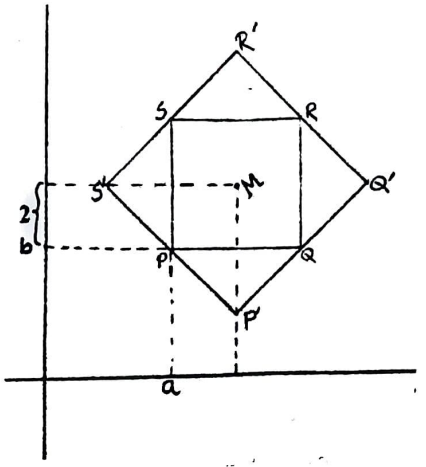


Figure 1: Transformation of Square for Question-1(a)

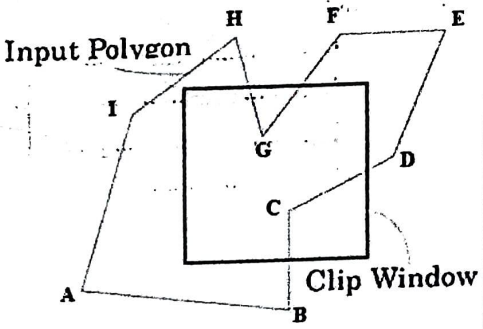


Figure 2: Input polygon for Question-2(a)

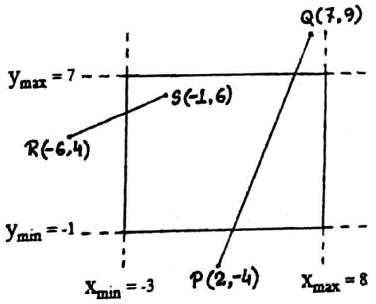


Figure 3: Line Clipping for Question-3(a)

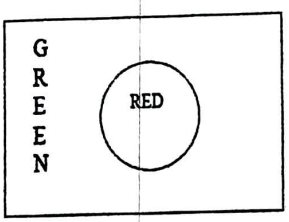


Figure 4: Fixed Region with filled color for Question-4(c)