**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

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| Examination: Mid Semester Exam  Duration: 1 hour and 10 minutes | Semester :Spring 2022  Full Marks: 40 |

CSE 423: Computer Graphics

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| Name: | ID: | Section: |

**Instructions:**

1. Answer all of the following questions.
2. Figures in the right margin indicate marks.
3. Non programmable calculators are allowed.
4. To answer some of the following questions, you will need four variables **A**, **B**, **C** and **D** which are sequentially the first, second, third and fourth pair of digits from the left in your student ID.  
   *For example, if your ID is 15101208, then A= 15, B= 10, C= 12 and D= 8.*

**Questions:**

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| **1.** | Suppose a line segment starts at coordinate (**A**, **B**) and ends at (**A**+**C**, **B**+10). | |  |
| a. | Find the slope (*m*) and intercept (*b*) of this line. | **4** |
| b. | Simulate the DDA line drawing algorithm to find the first three intermediary pixels of this line after (**A**, **B**). | **6** |
|  | | | |
| **2.** | a. | Briefly explain how the concept of 8-way symmetry is used in computer graphics to draw circles faster. [no pseudocode required] | **5** |
|  | b. | In the midpoint circle drawing algorithm, the term ***dinit = 1.25 - radius*** refers to the initial decision variable. Later, we saw that changing the value of ***dinit*** to ***1 - radius*** will not cause any change on the output of the algorithm.  Explain the reasoning behind this assumption. | **5** |
|  | | | |
| **3.** | a. | Assume that a line segment is given from (**A**, **C**) to (**B**, **D**).  Find out the midpoint of the line segment using the parametric equation. | **4** |
| b. | Suppose, an edge vector for a clipping window is given where the endpoints are (**A**, **B**) and (**C**, **D**) and N is the normal vector (-12, Q) that is perpendicular to this edge.  What will be the value of Q? | **3** |
| c. | Explain whether the Cyrus-beck line clipping algorithm works for concave polygons or not. | **3** |
| **3.** | | | |
| **4.** | a. | The bottom-left and top-right points of an axis-parallel rectangle are (-5, -5) and (5, 5).  Find the coordinates of the other two points of the rectangle. | **2** |
| b. | Find the outcodes of the points (**A**, **B**) and (**C**, **D**) with respect to this rectangle. | **4** |
|  | c. | Explain whether the Cohen-Sutherland line clipping algorithm works for concave polygons or not. | **4** |