

## Department of Computer Science and Engineering

Examination: Midterm Exam  
Duration: 1 hour

Semester: Summer 2022  
Full Marks: 30

CSE 423: Computer Graphics

Name:	ID:	Section:
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**Instructions:**

1. Answer all of the following questions.
2. Figures in the right margin indicate marks.
3. Non programmable calculators are allowed.

**Questions:**

1.	a.	Between DDA and midpoint algorithm for line drawing, which one would you prefer and why?	2
	b.	In the midpoint line drawing algorithm, the term $d_{init} = dy - 0.5dx$ refers to the initial decision variable. Later, we changed the value of $d_{init}$ to $2dy - dx$ . Explain the reason behind this change. Also explain whether this will affect the output of the algorithm.	2
	c.	Using the DDA line drawing algorithm, find out the first 3 pixels (after the starting pixel) of the line segment from (3,7) to (6,13). Show the steps of your calculation.	6
2.	a.	When drawing a circle with the midpoint circle algorithm, we determine the pixels in octant 1 and then use 8-way symmetry to find the corresponding pixels in other octants. Given a circle with center (a,b) and radius r, let one of its pixels in octant 1 be (x,y). Find the corresponding pixel in octant 7. (Octant reference is shown in the figure)  [Hint: If the center of the circle is shifted to (0,0), how will the pixel (x,y) change?]	4
	b.	Consider a circle with center (0,0) and radius 8. Find its first 5 pixels in octant 1. [Note: The starting pixel is included in the first 5 pixels.]	6
3.	a.	Jampi, Nivera and Tenz are three friends. There is a line segment partially inside the clipping window and so they used the Cyrus-beck algorithm individually to find out the line segment. After all 4 iterations of the Cyrus-beck algorithm they found some values of $t_E$ and $t_L$ . they are given below – <ol style="list-style-type: none"> <li>1. Tenz found <math>t_E = 0.74</math> and <math>t_L = 1.06</math></li> <li>2. Nivera found <math>t_E = 0.38</math> and <math>t_L = 0.27</math></li> <li>3. Jampi found <math>t_E = 0.69</math> and <math>t_L = 0.81</math></li> </ol> Using the above information, who do you think used the Cyrus-beck algorithm properly? Explain your answer.	3

b.	Given a line segment from (10,60) to (25,30). Find out the parametric equation $P(t)$ of the line. Using the parametric equation find out the coordinates of the point where $t=3/5$ .	<b>3</b>	
c.	Suppose a clipping region is from (-30,15) and (20,25). Using Cohen-Sutherland algorithm, find out the outcodes of point $P_1(10,18)$ and $P_2(-45,20)$ with respect to this clipping region. Using the outcodes of $P_1$ and $P_2$ , find out whether the line segment from $P_1$ to $P_2$ is completely outside, completely inside or partially inside of the clipping region.	<b>4</b>	

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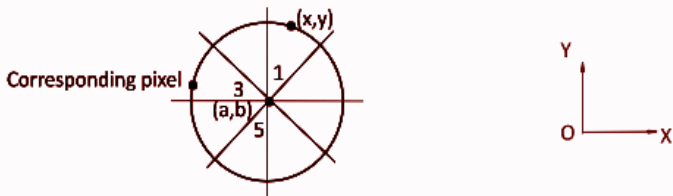
CSE 423: Computer Graphics

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**Instructions:**

1. Answer all of the following questions.
2. Figures in the right margin indicate marks.
3. Non programmable calculators are allowed.

**Questions:**

1.	a.	Between DDA and midpoint algorithm for line drawing, which one would you prefer and why?	2
	b.	Using the midpoint line drawing algorithm, find out the first 3 pixels (after the starting pixel) of the line segment from (2,10) to (10,15). Show the steps of your calculation.	6
	c.	Will the output of DDA and Midpoint algorithm always be the same for a line segment? If not, how can they be different? Explain with proper reasoning	2
2.	a.	When drawing a circle with the midpoint circle algorithm, we determine the pixels in octant 1 and then use 8-way symmetry to find the corresponding pixels in other octants. Given a circle with center (a,b) and radius r, let one of its pixels in octant 1 be (x,y). Find the corresponding pixel in octant 3. (Octant reference is shown in the figure)  [Hint: If the center of the circle is shifted to (0,0), how will the pixel (x,y) change?]  	4
	b.	Consider a circle with center (0,0) and radius 6. Find its first 5 pixels in octant 1. [Note: The starting pixel is included in the first 5 pixels.]	6
3.	a.	Jampi, Nivera and Tenz are three friends. There is a line segment partially inside the clipping window and so they used the Cyrus-beck algorithm individually to find out the line segment. After all 4 iterations of the Cyrus-beck algorithm they found some values of $t_E$ and $t_L$ . they are given below – 4. Tenz found $t_E = -0.3$ and $t_L = 0.56$ 5. Nivera found $t_E = 0.15$ and $t_L = 0.63$ 6. Jampi found $t_E = 0.67$ and $t_L = 0.48$ Using the above information, who do you think used the Cyrus-beck algorithm properly? Explain your answer.	3

b.	Given a line segment from (20,30) to (80,60). Find out the parametric equation $P(t)$ of the line. Using the parametric equation find out the coordinates of the point where $t=4/5$ .	<b>3</b>	
c.	Suppose, a clipping region is from (20,-80) and (60,40). Using Cohen-Sutherland algorithm, find out the outcodes of point $P_1(10,-95)$ and $P_2(70,50)$ with respect to this clipping region. Using the outcodes of $P_1$ and $P_2$ , find out whether the line segment from $P_1$ to $P_2$ is completely outside, completely inside or partially inside of the clipping region.	<b>4</b>	