

**BACHELOR OF COMPUTER SCIENCE & ENGG. EXAMINATION, 2021**  
**(3<sup>rd</sup> YEAR , 1<sup>st</sup> SEMESTER)**

**COMPUTER GRAPHICS**

**Time: One Hour**

**Full Marks: 30**

**Read the Following Instructions Carefully:**

- Put your Name, Class Roll No, Primary Mobile phone no, Email at the first page
- Put Class Roll No at the top-right corner of every page
- Put your signature at the bottom of every page
- Let ***R*** be the last two digits of your Class Roll No. If your Roll No. is 23, then, ***R*** = 23.

**Answer ALL questions**

1. Use the Bresenham's method to derive decision parameters for generating points along a straight line path with slope in the range  $0 < m < 1$ . Generate the intermediate set of points for a line with endpoints (20,10) and (***R***,18). **(20)**
2. What are interpolation and approximation splines? what is a convex hull? what is a control graph? Derive the equation of a cubic Bezier curve. **(10)**

**BACHELOR OF COMPUTER SCIENCE & ENGG. EXAMINATION, 2021**  
(3<sup>rd</sup> YEAR , 1<sup>st</sup> SEMESTER)

**COMPUTER GRAPHICS**

**Time: Three Hours**

**Full Marks: 70**

**Read the Following Instructions Carefully:**

- Put your Name, Class Roll No, Primary Mobile phone no, Email at the first page
- Put Class Roll No at the top-right corner of every page
- Put your signature at the bottom of every page
- Let  $R$  be the last two digits of your Class Roll No. and let  $R_1$  and  $R_2$  be the two digits in your Roll No. For example, If your Roll No. is 23, then,  $R = 23$ ,  $R_1 = 2$  and  $R_2 = 3$ ;  $R_1 + R_2 = 5$ . If your Roll No. is 05, then,  $R = 5$ ,  $R_1 = 0$  and  $R_2 = 5$ ;  $R_1 + R_2 = 5$ .

**Answer ALL questions**

<b><u>Group-1 (20 Marks)</u></b>			
<b>1.</b>	<b>a)</b>	Given input ellipse parameters $r_x = 5 + (R_1 + R_2)$ , and $r_y = 5$ , centred at origin, illustrate the steps in the midpoint ellipse algorithm by determining raster positions along the ellipse path in the first quadrant.	<b>15</b>
	<b>b)</b>	Check if point $(R_1, R_2)$ is inside concave polygon defined by vertices (1, 1), (6, 3), (4, 6), (1, 5), (2, 3), (1,1).	<b>5</b>

<b><u>Group-2 (20 Marks)</u></b>			
<b>2.</b>	<b>a)</b>	Let ABCD be the rectangular window with A(0,0), B(10,0), C(10,10), D(0,10). Use Liang Barsky Algorithm to clip the line XY, such that X(-5, $R_1$ ) and Y(15, $R_2$ ).	<b>15</b>
	<b>b)</b>	Show that the transformation matrix for reflection about the line $y = x$ , is equivalent to a reflection relative to the $x - axis$ , followed by a counter-clockwise rotation of $90^\circ$ .	<b>5</b>

<b><u>Group-3 (20 Marks)</u></b>			
<b>3.</b>	<b>a)</b>	Prove that the multiplication of three-dimensional transformation matrices for each of the following sequence of operations is commutative (i.e., $A \times B = B \times A$ ) i) any two successive translations ii) any two successive scaling operations iii) any two successive rotations in “any one” of the coordinate axes	<b>10</b>
	<b>b)</b>	What are the different types of projections? Derive the matrix equation for perspective projection.	<b>10</b>

<b><u>Group-4 (10 Marks)</u></b>			
<b>4.</b>	<b>a)</b>	Derive the formulation for diffuse and specular reflections from multiple light sources.	<b>5</b>
	<b>b)</b>	Briefly discuss the A-Buffer algorithm for hidden surface removal	<b>5</b>