

**BACHELOR OF COMPUTER SCIENCE & ENGG. EXAMINATION, 2021
(3rd YEAR, 1st 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
(3rd YEAR , 1st 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

Group-1 (20 Marks)			
1.	a)	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.	15
	b)	Check if point (R_1, R_2) is inside concave polygon defined by vertices $(1, 1), (6, 3), (4, 6), (1, 5), (2, 3), (1, 1)$.	5

Group-2 (20 Marks)			
2.	a)	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).	15
	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° .	5

Group-3 (20 Marks)			
3.	a)	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	10
	b)	What are the different types of projections? Derive the matrix equation for perspective projection.	10

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