BACHELOR OF COMPUTER SCIENCE & ENGG. EXAMINATION, 2022
(3rd YEAR , 1st SEMESTER)

COMPUTER GRAPHICS

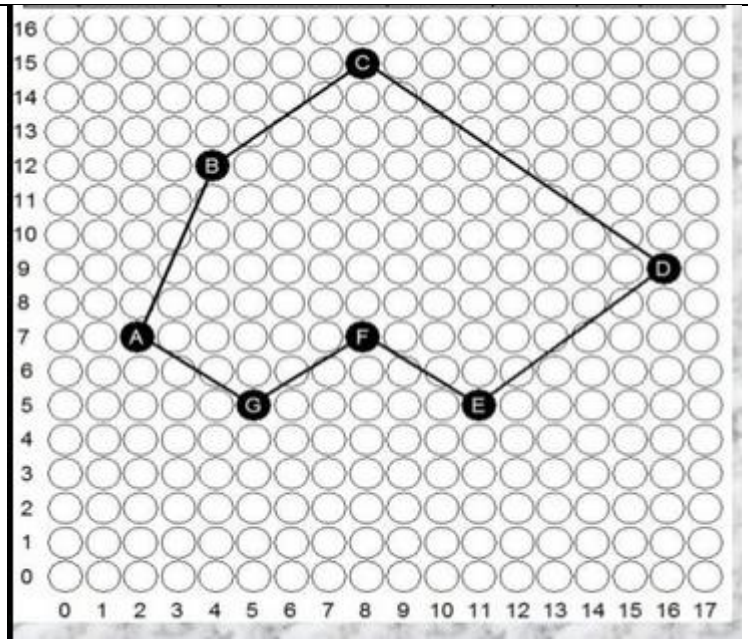
Time: Three Hours **Full Marks: 70**

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 $\boldsymbol{R}$ be the last two digits of your Class Roll No. and let $\boldsymbol{R_1}$ and $\boldsymbol{R_2}$ be the two digits in your Roll No. For example, If your Roll No. is 23, then, $\boldsymbol{R}$ = 23, $\boldsymbol{R_1}$ = 2 and $\boldsymbol{R_2}$ = 3; $\boldsymbol{R_1 + R_2 = 5}$. If your Roll No. is 05, then, $\boldsymbol{R}$ = 5, $\boldsymbol{R_1}$ = 0 and $\boldsymbol{R_2}$ = 5; $\boldsymbol{R_1 + R_2 = 5}$.

Answer ALL questions

		Group-1 (20 Marks)	
1.	**a)**	Use Bresenham's Midpoint method to derive decision parameters for generating points along an ellipse centered at ($\boldsymbol{R_1}$, $\boldsymbol{R_2}$), $\boldsymbol{rx}$ = 7+$\boldsymbol{R_1}$ and $\boldsymbol{ry}$ = 5+$\boldsymbol{R_2}$. Show all the calculations for Quadrant 1 (for both Region 1 and 2) and generate the symmetric points in the other three quadrants. N.B: if $\boldsymbol{rx}$ is equal to $\boldsymbol{ry}$, consider, $\boldsymbol{rx}$=$\boldsymbol{rx}$+2.	**20**

		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 Cohen Sutherland Algorithm to clip the line XY, such that X(-5,$\boldsymbol{R_1}$) and Y(15,$\boldsymbol{R_2}$).	**10**
	b)	 Consider the above polygon and use Scanline fill algorithm to generate the edge intersections and inside points for y=5, y=6 and y=7.	**10**

		Group-3 (20 Marks)	
3.	**a)**	Q A unit square is transformed by a 2 × 2 transformation matrix. The resulting position vectors are $\begin{pmatrix} 0 & 2 & 8 & 6 \\ 0 & 3 & 4 & 1 \end{pmatrix}$ What is the transformation matrix? Hint: Let the unit square have coordinates (x, y), $(x + 1, y)$, $(x + 1, y + 1)$, $(x, y + 1)$ and let the transformation matrix be $\begin{pmatrix} a & c \\ b & d \end{pmatrix}$	**6**
	b)	Prove that if rotation angle is θ the transformation matrix formed when multiplied by the transformation matrix formed when angle is $-\theta$ is equal to identity matrix.	**4**
	c)	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**

		Group-4 (10 Marks)	
4.	**a)**	Briefly discuss Phong surface rendering model. Discuss its advantages and disadvantages with respect to the Gouraud model.	**5**
	b)	Briefly discuss the Painter's algorithm for hidden surface removal	**5**