University of Mumbai

Examination 2020 under cluster __ (Lead College: _____)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Computer Engineering**Curriculum Scheme: Rev2019
Examination: SE Semester III

Course Code: CSC305 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	В
Q2.	В
Q3.	С
Q4	С
Q5	D
Q6	D
Q7	С
Q8.	D
Q9.	D
Q10.	В
Q11.	A
Q12.	A
Q13.	В
Q14.	С
Q15.	В
Q16.	D
Q17.	В
Q18.	A
Q19.	A
Q20.	A

Question	Expected Ans	Marks	
Q2 A i	Definition and list of at least 5 applications with brief description of the same	5	
Q2 A ii	Procedure with diagram explaining the same		
Q2 A iii	Step 1 – translate an object so that fix point coinsides with origin Step 2 – scale an object with given parameters Step 3 – translate an object back to its original position At each step diagram and transformation matrix is expected. Multiply to get composite matrix		
Q2 B i	Centre (50,50) r = 12	10	
	$P_0 = 1 - r = -11$ plot (0,12)		
	< 0 plot (1,12) $P_1 = P_0 + 2x_{k+1} + 1$		
	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		
	< 0 plot (2,12) $P_2 = P_1 + 2x_{k+1} + 1$		
	= -8 + 2.2 + 1 = -3		
	< 0 plot (3,12) $P_3 = P_2 + 2x_{k+1} + 1$		
	= -3 + 2.3 + 1 = 4 > 0 plot (4,11)		
	$P_4 = P_3 + 2x_{k+1} + 1 - 2Y_{k+1}$ $= 4 + 2.4 + 1 - 2.11$ $= -8$		
	$ \begin{array}{c} <0 & \text{plot (5,11)} \\ P_5 = P_4 + 2x_{k+1} + 1 & \\ = -8 + 2.5 + 1 & \end{array} $		
	= 3 > 0 P6 = P5 + 2xk+1 + 1 - 2Yk+1 2 2 6 1 2 10 plot (6,10)		
	$ \begin{array}{c} = 3 + 2.6 + 1 - 2.10 \\ = -4 \\ < 0 \\ P_6 = P_5 + 2x_{k+1} + 1 \end{array} \qquad \text{plot (7,10)} $		
	= -4 + 2.7 + 1 = 11 > 0 plot (8,9)		
	$P_7 = P_6 + 2x_{k+1} + 1 - 2Y_{k+1}$ $= 11 + 2.8 + 1 - 2.9$ $= 10$		
	> 0 plot (9,8) As $X \ge Y$, all points in one octant are computed.		
	Now, as centre of circle is $(50,50)$ $X_{new} = X_{old} + 50$		

	$Y_{new} = Y_{old} + 50$			
	(X,Y)	(X_{new}, Y_{new})		
	(0,12)	(50,62)		
	(1,12)	(51,62)		
	(2,12)	(52,62)		
	(3,12)	(53,62)		
	(4,11)	(54,61)		
	(5,11)	(55,61)		
	(6,10)	(56,60)		
	(7,10)	(57,60)		
	(8,9)	(58,59)		
	(9,8)	(59,58)		
	Points in other octants of	can be computed using	g 8 way symmetry	
Q2 B ii	Derivation with suitable	e diagrams		10
Q3 A i	Definition and explanation of any one method in brief		5	
Q3 A ii	Taking general rotation angles Θ_1 and Θ_2 ,		5	
	$R(\Theta_1) + R(\Theta_2) = R(\Theta_1 + \Theta_2)$			
Q3 A iii	Definition with suitable example/diagram		5	
Q3 B i	Definitions and derivation with supporting diagrams		10	
Q3 B ii	Explanation with suitab	le diagrams		10

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks		
1.	In mid point ellipse method, coordinate of points lying on ellipse are calculated in		
Option A:	One quadrant first and others by successive rotation		
Option B:	One quadrant first and others by successive reflection		
Option C:	One quadrant first and others by successive translation		
Option D:	All quadrants		
_			
2.	In DDA line drawing method, for lines having negative slope with absolute value		
	greater than 1 and taking right end point as starting point, the X and Y coordinate		
	increments are		
Option A:	1/m and -1		
Option B:	-1/m and 1		
Option C:	-1 and -m		
Option D:	1 and m		
3.	In Homogenous Coordinate System, all Transformations are captured by		
Option A:	Addition		
Option B:	Subtraction		
Option C:	Multiplication		
Option D:	Division		
4.	In Liang Barsky line clipping method, for a parallel lines, k indicates window		
	boundary if		
Option A:	$P_k > 0$		
Option B:	$P_k < 0$		
Option C:	$P_k = 0$		
Option D:	$P_k \neq 0$		
5.	What is the 1 st point on the circumference of the circle centered at (10,10) with		
	radius = 10, using midpoint circle method		
Option A:	(0, 10)		
Option B:	(1,10)		
Option C:	(1,9)		
Option D:	(10,20)		
6.	Coordinates of clipping window are (4,4) and (9,8). A line is drawn from point		
	A(2,2) to point $B(12,9)$. The result of logical AND operation on the region codes		

$ \begin{array}{c} \text{Option A:} & 0101 \\ \text{Option B:} & 1010 \\ \text{Option C:} & 1111 \\ \text{Option D:} & 0000 \\ \hline \\ 7. & A \text{ circle is drawn at } (30,30) \text{ with radius} = 10. \text{ Its mirror image cannot be obtained by} \\ \text{Option A:} & \text{Rotation by } 90^{\circ}. \\ \text{Option B:} & \text{Reflection about } Y\text{-axis} \\ \text{Option D:} & \text{Scaling by } S_x = -1 \text{ and } S_y = 1 \\ \hline \\ 8. & A \text{ conceptual line is drawn starting from the particular point and extending to a distance point outside the coordinate extends of the object in direction of X-axis, the line intersects twice with the polygon edges and once with the polygon vertex. Then according to inside outside test, the point lies \\ \hline \text{Option A:} & \text{Outside the polygon} \\ \hline \text{Option B:} & \text{Inside the polygon} \\ \hline \text{Option C:} & \text{On the boundary of the polygon} \\ \hline \text{Option D:} & \text{Cannot say} \\ \hline \\ 9. & \text{To clip concave area, which of the following algorithm is best suited} \\ \hline \text{Option A:} & \text{Cohen Sutherland line clipping method} \\ \hline \text{Option B:} & \text{Liang barsky line clipping method} \\ \hline \text{Option D:} & \text{Sutherland Hodgeman polygon clipping method} \\ \hline \text{Option D:} & \text{Sutherland Hodgeman polygon clipping method} \\ \hline \text{Option B:} & \text{Z value is not stored in depth buffer} \\ \hline \text{Option C:} & \text{Z value is stored as surface intensity value} \\ \hline \text{Option D:} & \text{Z value is stored in depth buffer} \\ \hline \text{Option D:} & \text{Z value is stored in depth buffer} \\ \hline \text{Option D:} & \text{Calue is stored in depth buffer} \\ \hline \text{Option A:} & \text{Give the series of transformation required to rotate an object about any arbitrary axis not parallel to any one of the coordinate axes in 3D space} \\ \hline \text{Option B:} & \text{R = } [T] [R_y] [R_z] [R_x^{-1}] [R_x^{-1}] [T^{-1}] \\ \hline \text{Option B:} & \text{R = } [T] [R_y] [R_z] [R_x^{-1}] [R_x^{-1}] [T^{-1}] \\ \hline \text{Option C:} & \text{R = } [T] [R_y] [R_z] [R_x^{-1}] [R_x^{-1}] [R_x^{-1}] [T^{-1}] \\ \hline \text{Option D:} & \text{R = } [T] [R_y] [R_z] [R_x^{-1}] [R_x^{-1$	1	is
$ \begin{array}{c} Option B: \\ Option C: \\ I111 \\ Option D: \\ O000 \\ \hline $	Ontion A.	
$ \begin{array}{c} \text{Option C:} & 1111 \\ \text{Option D:} & 0000 \\ \hline \\ 7. & A \text{ circle is drawn at } (30,30) \text{ with radius} = 10. \text{ Its mirror image cannot be obtained by} \\ \text{Option A:} & \text{Rotation by } 90^0. \\ \text{Option B:} & \text{Reflection about Y-axis} \\ \text{Option C:} & \text{Translation by } T_x = 60 \text{ and } T_y = 0 \\ \text{Option D:} & \text{Scaling by } S_x = -1 \text{ and } S_y = 1 \\ \hline \\ 8. & A \text{ conceptual line is drawn starting from the particular point and extending to a distance point outside the coordinate extends of the object in direction of X-axis, the line intersects twice with the polygon edges and once with the polygon vertex. Then according to inside outside test, the point lies \\ \hline \text{Option A:} & \text{Outside the polygon} \\ \hline \text{Option B:} & \text{Inside the polygon} \\ \hline \text{Option D:} & \text{Cannot say} \\ \hline \\ 9. & \text{To clip concave area, which of the following algorithm is best suited} \\ \hline \text{Option A:} & \text{Cohen Sutherland line clipping method} \\ \hline \text{Option B:} & \text{Liang barsky line clipping method} \\ \hline \text{Option D:} & \text{Weiler Atherton polygon clipping method} \\ \hline \text{Option D:} & \text{Weiler Atherton polygon clipping method} \\ \hline 10. & \text{In depth buffer method, when } z > \text{depth of } (x,y) \\ \hline \text{Option B:} & Z \text{ value is stored in depth buffer} \\ \hline \text{Option C:} & Z \text{ value is stored as surface intensity value} \\ \hline \text{Option D:} & Z \text{ value is stored as surface intensity value} \\ \hline \text{Option C:} & \text{Give the series of transformation required to rotate an object about any arbitrary axis not parallel to any one of the coordinate axes in 3D space} \\ \hline \text{Option B:} & R = [T] [R_x][R_y] [R_y] [R_x^{-1}] [R_x^{-1}] [T^{-1}] \\ \hline \text{Option C:} & R = [T] [R_x][R_y] [R_x] [R_y^{-1}] [R_x^{-1}] [T^{-1}] \\ \hline \text{Option D:} & R = [T] [R_x][R_y] [R_x] [R_x^{-1}] [R_x^{-1$		
Option D: A circle is drawn at (30,30) with radius = 10. Its mirror image cannot be obtained by Option A: Option B: Option C: Option D: Scaling by S _x = -1 and S _y = 1 A conceptual line is drawn starting from the particular point and extending to a distance point outside the coordinate extends of the object in direction of X-axis, the line intersects twice with the polygon edges and once with the polygon vertex. Then according to inside outside test, the point lies Option A: Outside the polygon Option B: Inside the polygon Option D: Cannot say 9. To clip concave area, which of the following algorithm is best suited Option A: Cohen Sutherland line clipping method Option B: Liang barsky line clipping method Option D: Weiler Atherton polygon clipping method 10. In depth buffer method, when z > depth of (x,y) Option B: Z value is not stored in depth buffer Option C: Z value is stored as surface intensity value Option D: Z value is stored as surface intensity value Option D: A = [T] [R _x][R _y] [R _z] [R _x ⁻¹] [R _x ⁻¹] [T ⁻¹] Option B: R = [T] [R _x][R _z] [R _x] [R _x] [R _x] [R _x] [T ⁻¹] Option C: R = [T] [R _x][R _z] [R _x] [R _x] [R _x] [R _x] [R _z]		
7. A circle is drawn at (30,30) with radius = 10. Its mirror image cannot be obtained by Option A: Rotation by 90°. Option B: Reflection about Y-axis Option C: Translation by T _x = 60 and T _y = 0 Option D: Scaling by S _x = -1 and S _y = 1 8. A conceptual line is drawn starting from the particular point and extending to a distance point outside the coordinate extends of the object in direction of X-axis, the line intersects twice with the polygon edges and once with the polygon vertex. Then according to inside outside test, the point lies Option A: Outside the polygon Option B: Inside the polygon Option D: Cannot say 9. To clip concave area, which of the following algorithm is best suited Option B: Liang barsky line clipping method Option B: Sutherland Hodgeman polygon clipping method Option D: Weiler Atherton polygon clipping method 10. In depth buffer method, when z > depth of (x,y) Option A: Point is visible Option B: Z value is not stored in depth buffer Option C: Z value is stored as surface intensity value Option D: Z value is stored in depth buffer Option C: Z value is stored in depth buffer Option C: R = [T] [R _x][R _y] [R _x ⁻¹] [R _x ⁻¹] [T ⁻¹] Option C: R = [T] [R _x][R _y] [R _x] [R _x ⁻¹] [R _x ⁻¹] [T ⁻¹] Option C: R = [T] [R _x][R _y][R _x] [R _x ⁻¹] [R _x ⁻¹] [T ⁻¹] Option C: R = [T] [R _x][R _y][R _x][T] [R _x ⁻¹] [R _x ⁻¹]		
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	/.	I.
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$\begin{array}{llllllllllllllllllllllllllllllllllll$	option 2.	2 value is stored in depart outer
$\begin{array}{llllllllllllllllllllllllllllllllllll$	11.	Give the series of transformation required to rotate an object about any arbitrary
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	_	
In window to viewport mapping, which of the following set of transformations	-	/at -at / / /
12. In white work mapping, which of the following set of transformations	12.	In window to viewport mapping, which of the following set of transformations
are involved		
Option A: Translation and scaling	Option A:	Translation and scaling
Option B: Scaling and rotation		
Option C: Scaling and reflection	Option C:	
Option D: Rotation and translation		
13. What happens when in 3D space uniform scaling with respect to origin is	13.	What happens when in 3D space uniform scaling with respect to origin is
performed,		
I) Original shape of object may change		I) Original shape of object may change

	II) Original position of object may change
Option A:	Only I
Option B:	Only II
Option C:	Both I and II
Option D:	Neither I nor II
option 2.	
14.	Which of the following input is accepted only by Boundary Fill method and not
	by Flood fill method
Option A:	Fill color
Option B:	Background color
Option C:	Edge color
Option D:	Seed pixel
15.	To convert a square into a parallelogram, which transformation is used
Option A:	Scaling
Option B:	Shear
Option C:	Scaling followed by rotation
Option D:	Rotation
16.	Which of the following is not a property of Bezier curve
Option A:	Bezier curves are multivalued.
Option B:	A Bezier curve is independent of the coordinate system used to measure the
	location of control points.
Option C:	Bezier curves provide global control.
Option D:	Bezier curves are not variation diminishing
17.	Which of the following statement does not define commuter quantics
Option A:	Which of the following statement does not define computer graphics The technology that deals with designs and pictures on computers.
Option B:	Visual images or designs on some surface such as wall, paper to inform, illustrate
Option B.	or entertain.
Option C:	Almost everything on computer that is not text or sound.
Option D:	It is an art of drawing pictures on a computer screen with the help of
Option B.	programming.
	P-06-manage
18.	First reflect a point about x-axis, then perform a counter clock wise rotation of
	90°, this is equivalent to
Option A:	Reflection about a line X=Y
Option B:	Reflection about a line X=-Y
	Rotation about a line X=Y
Option C:	Kotation about a line A – I
Option C:	Rotation about a line X=1 Rotation about a line X=-Y
Option D:	
Option D:	Rotation about a line X=-Y
Option D:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation
Option D: 19. Option A:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation 16/9
Option D: 19. Option A: Option B:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation 16/9 24/9
Option D: 19. Option A: Option B: Option C: Option D:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation 16/9 24/9 8/6 64/27
Option D: 19. Option A: Option B: Option C:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation 16/9 24/9 8/6 64/27 Let N be the normal vector of the plane surface with N=(A,B,C). For a plane to be
Option D: 19. Option A: Option B: Option C: Option D:	Rotation about a line X=-Y What is the length of Koch curve after second Approximation 16/9 24/9 8/6 64/27

Option B:	C >= 0
Option C:	C < 0
Option D:	C > 0

Q.2 A	Solve any Two 5 marks each
i.	What is computer graphics? Discuss application areas in computer graphics
ii.	Write a boundary fill procedure to fill a polygon using 8-connected
	approach.
iii.	Derive the composite matrix to scale an object with respect to a fixed point
Q.2 B	Solve any One 10 marks each
i.	Given radius $r = 12$ and center coordinates (50,50), compute the
	coordinates of points lying on the circle using Mid point circle algorithm
ii.	Derive transformation matrix for perspective projection.

Q.3 A	Solve any Two	5 marks each
i.	What is aliasing and explain any one antialiasing technique.	
ii.	Prove that 2D rotations are additive	
iii.	Define the following terms with suitable example/diagram	
	a. Variation diminishing property	
	b. Order of continuity	
Q.3 B	Solve any One	10 marks each
i.	Define window, viewport and derive the equations for windo	ow to viewport
	transformation	
ii.	What is keyframing and explain character and facial animati	on