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

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	B
Q3.	C
Q4	C
Q5	D
Q6	D
Q7	C
Q8.	D
Q9.	D
Q10.	B
Q11.	A
Q12.	A
Q13.	B
Q14.	C
Q15.	B
Q16.	D
Q17.	B
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	5
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	5
Q2 B i	Centre (50,50) r = 12 plot (0,12) $P_0 = 1-r = -11$ < 0 plot (1,12) $P_1 = P_0 + 2x_{k+1} + 1$ $= -11 + 2.\ 1 + 1$ $=-8$ < 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) $P_4 = P_3 + 2x_{k+1} + 1 – 2Y_{k+1}$ $= 4 + 2.4 + 1 – 2.\ 11$ $= -8$ < 0 plot (5,11) $P_5 = P_4 + 2x_{k+1} + 1$ $= -8 + 2.5 + 1$ $= 3$ > 0 plot (6,10) $P_6 = P_5 + 2x_{k+1} + 1 – 2Y_{k+1}$ $= 3 + 2.6 + 1 – 2.10$ $= -4$ < 0 plot (7,10) $P_6 = P_5 + 2x_{k+1} + 1$ $= -4 + 2.7 + 1$ $= 11$ > 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 $X \geq Y$, all points in one octant are computed. Now, as centre of circle is (50,50) $X_{new} = X_{old} + 50$	10

<table>
<tr><td></td><td>$Y_{new} = Y_{old} + 50$

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

	is
Option A:	0101
Option B:	1010
Option C:	1111
Option D:	0000
7.	A circle is drawn at (30,30) with radius = 10. Its mirror image cannot be obtained by
Option A:	Rotation by 90^0.
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 C:	On the boundary of 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 C:	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
11.	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
Option A:	$R = [T] [R_x][R_y] [R_z] [R_y^{-1}] [R_x^{-1}] [T^{-1}]$
Option B:	$R = [T] [R_y][R_z] [R_x] [R_x^{-1}] [R_y^{-1}] [T^{-1}]$
Option C:	$R = [T] [R_y][R_z] [R_x] [R_y^{-1}] [R_z^{-1}] [T^{-1}]$
Option D:	$R = [R_x][R_y][R_z][T] [R_x^{-1}] [R_y^{-1}] [R_z^{-1}]$
12.	In window to viewport mapping, which of the following set of transformations are involved
Option A:	Translation and scaling
Option B:	Scaling and rotation
Option C:	Scaling and reflection
Option D:	Rotation and translation
13.	What happens when in 3D space uniform scaling with respect to origin is performed, 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
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 computer graphics
Option A:	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 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 programming.
18.	First reflect a point about x-axis, then perform a counter clock wise rotation of 90^0, this is equivalent to ___
Option A:	Reflection about a line X=Y
Option B:	Reflection about a line X=-Y
Option C:	Rotation about a line X=Y
Option D:	Rotation about a line X=-Y
19.	What is the length of Koch curve after second Approximation
Option A:	16/9
Option B:	24/9
Option C:	8/6
Option D:	64/27
20.	Let N be the normal vector of the plane surface with N=(A,B,C). For a plane to be a back face
Option A:	C <= 0

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 window to viewport transformation
ii.	What is keyframing and explain character and facial animation