Jayawant Shikshan Prasarak Mandal's

JSPM's Group of Institute

Name of Institute

Varified & all the entries found correct

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A-

Roll No (In Figures) Centre

Roll No (In Words)

Day & Date : Examination :

Subject : Section :

Course / Paper No. : Medium of Answer :

Main Ans. Book + No. Of Suppliments : Total

Question No.	1	2	3	4	5	6	7	8	9	10	Total	Sign of Examiner
Marks Obtained												

Use of coloured pencil or ink is strictly prohibited except in case of diagrams and sketches
(Write on both sides and start writing on this page.)

Insem Paper Solution Feb-2023.

Q2]

9] Explain Mid-Point circle Drawing algorithm? List its advantages and disadvantages over DDA circle Drawing Algorithm.

→ Mid-point circle Drawing Algorithm :-

The mid-point circle Drawing Algorithm is an efficient method to draw a circle by determining the next pixel position based on the decision parameter. It uses incremental integer calculations making it faster and more accurate than

other methods like the DDA.

* Working Principle:-

① The circle is drawn in the first octant (from 0° to 45°) and the remaining points are mirrored in the other seven octants.

② The decision parameter p is used to determine the next pixel position.

③ If $p<0$, the next point is directly to the right $(x+1, y)$.

④ If $p \geq 0$, the next point is diagonally up and to the right $(x+1, y-1)$.

⑤ The decision parameter is updated iteratively

* Algorithm:-

① Initialize the circle radius r, centre (x_c, y_c) and starting point $(x_0, y_0) = (0, r)$.

② Calculate the initial decision parameter
$p = 1 - r$

③ For each point in the first octant:
- plot $(x+x_c, y+y_c)$ and its symmetric points in other octant.
- update the decision parameter.
  > if $p<0$: $p = p + 2x + 3$

- If $p \geq 0$: $p = p + (2x - y) + 3$.
- Increment x and decrement y accordingly

4) Repeat until $x \geq y$.

★ Advantages of Mid-point circle algorithm over over DDA are.

① uses only integer arithmetic
② faster and more efficient
③ More accurate.
④ Suitable for hardware implementation
⑤ Symmetric points calculated easily.

★ Disadvantages :-

① Restricted to circles only (cannot handle ellipses or arbitrary curves directly).
② Slightly more complex than DDA due to multiple decision conditions.
③ Does not work well for anti-aliased or smooth curves.

Q2]

b] What is aliasing and anti-aliasing? How aliasing effect is removed in vector generation algorithm 2

→ Aliasing:-

Aliasing is a visual artifact that occurs when high-resolution images or smooth curves are represented using a limited number of pixel. This results in jagged edges or stair-step.

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especially noticeable in diagonal lines or curves.

☆ Causes of Aliasing :-
- Insufficient resolution (low sampling rate)
- Mapping continuous signals (such as smooth curves) to discrete pixel.
- Improper rendering of high frequency details.

☆ Examples of Aliasing :-
> Jagged edges in digital image (also called the "staircase effect".
> moire pattern in textures and images.

* Anti-Aliasing :-
Anti-Aliasing is a technique used to reduced the jagged edges and smoothen curves in digital images. It works by averaging colors at the edges to create a smoother transition b/w pixels.

* methods of Anti Aliasing. is a technique used to reduced the jagged edges and smoothen curves in the digital image. It works by averaging colors at the edges to create a smoother transition b/w pixels.

① Super-sampling Anti-Aliasing (SSAA):-
- Renders the image at a higher resolution and then downsamples it.

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- produces high-quality results but is computationally expensive.

2.) Multi-Sampling Anti-Aliasing (MSAA):
- Samples multiple point within each pixel to smooth edges
- more efficient than SSAA but does not handle textures well.

3) Fast Approximate Anti-Aliasing (FXAA):
- uses post-processing to blur jagged edges.
- faster but can make images look softer

4) Adaptive Anti-Aliasing :-
- Applies anti-aliasing only where necessary, reducing performance overheaded.

★ Removing Aliasing in Vector Generation Algorithm.

① Wu's line Algorithm :-
- uses pixel intensity blending
- Adjusts the brightness of pixels along the line to create a smoother appearance.

② Filtering Techniques.
- ~~post~~ Pre-Filtering : Samples of the image at a higher resolution before rendering
- post-filtering : Applies smoothing filters to remove jagged edges

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③ Sub-pixel Rendering:
- uses multiple sub-pixels with a single pixel to improved smoothness
- commonly used in fonts.

④ Increased Resolution :-
- drawing vectors at higher resolutions reduced visible jaggedness
- more pixels allow finer detail representation

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Insem Paper Solution March 2024.

Q2] a] Consider a line from P (2,3) to Q (7,11) use DDA line drawing algorithm to rasterize the line from P to Q. Draw the pixel with rasterization of line.

→ step① :- P (2,3) & Q (7,11).
x_0, y_0 x_1, y_1

step② :-

$dx = x_1 - x_0 = 5 \cdot 7 - 2 = 5$

$dy = y_1 - y_0 = 11 - 3 = 8$

step③ :- $d(y) > d(x)$

$8 > 5$

$\therefore$ steps $= d(y) = 8$

step④ :-

$x\ increment = \frac{dx}{steps} = \frac{5}{8} = 0.625$

$y\ increment = \frac{dy}{steps} = \frac{8}{8} = 1.$

step⑤ :-

	x	y	x_{new}	y_{new}	Round off (x_{new}, y_{new})
①	2	3	$2+0.625 = 2.625$	$3+1=4$	(3,4)
②	2.625	4	$2.625+0.625 = 3.25$	$4+1=5$	(3,5)

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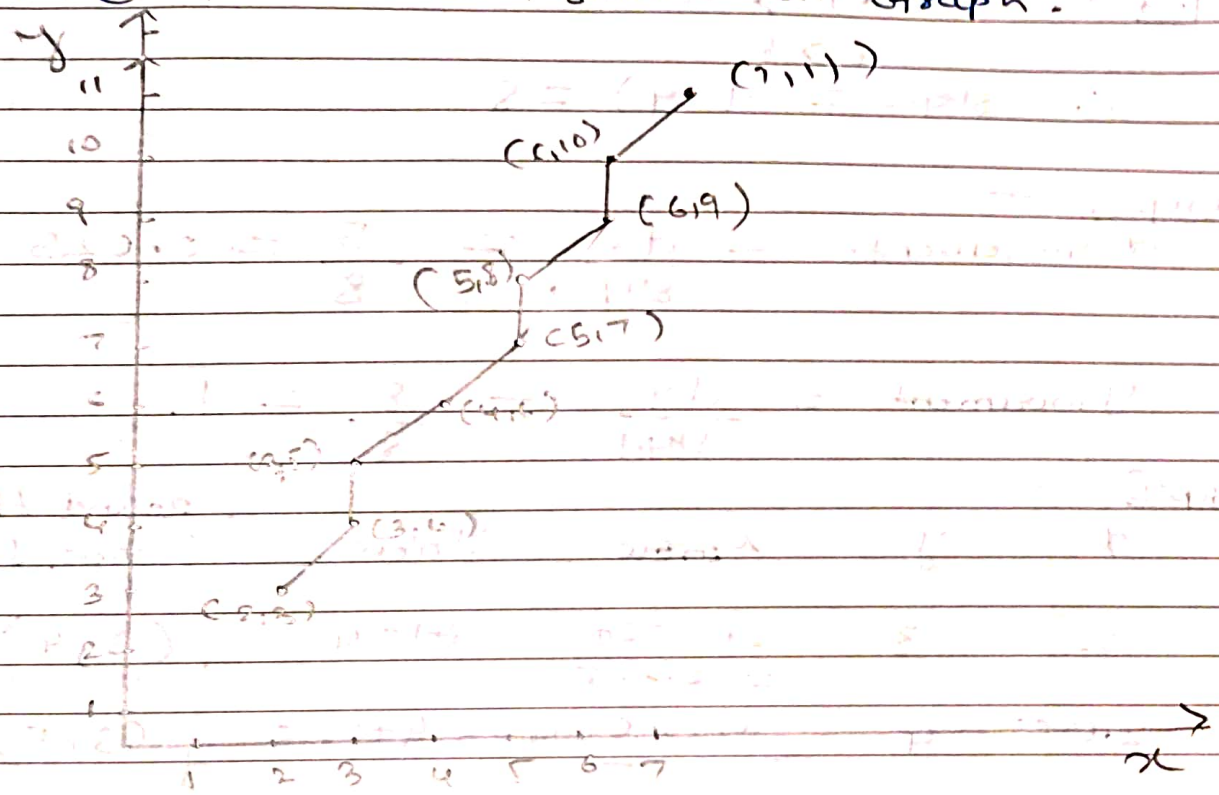
	x	y	xnew	ynew	Round off (xnew, ynew)
③	3.25	5	$=3.25+0.625$ $=3.875$	$5+1=6$	(4, 6)
④	3.875	6	$=3.875+0.625$ $=4.5$	$6+1=7$	(5, 7)
⑤	4.5	7	$=4.5+0.625$ $=5.125$	$7+1=8$	(5, 8)
⑥	5.125	8	$=5.125+0.625$ $=5.75$	$8+1=9$	(6, 9)
⑦	5.75	9	$=5.75+0.625$ $=6.375$	$9+1=10$	(6, 10)
⑧	6.375	10	$=6.375+0.625$ $=7$	$10+1=11$	(7, 11)

Step ⑤ plot (xnew, ynew) on Graph.



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Q2] b] what is aliasing and antialising? How aliasing ? How aliasing effect is removed. in vector generation algorithm :

) prefter Q2 (b) of 7th sem paper solution feb 2023