	B. M.S. COLLEGE OF ENGINEERING, BANGALORE-19 (Autonomous Institute, Affiliated to VTU) **Department Name: CSE**

Third INTERNALS – Online		
Course Code : 20CS5PEAAG	**Course Title : Advanced Algorithms**	
Semester :5th	**Maximum Marks: 40**	**Date: 6-01-2021**
Faculty Handling the Course:	NN,GRP	
Instructions: ***Internal choice is provided in Part C.***		

PART-A

Total 5 Marks (No choice)

No.	Question	Marks	CO No.	Level
1a	Describe the Jarvis's march technique of computing the convex hull. Answer: given at the end.	**5M**	**3**	**2**

PART-B

Total 15 Marks (No Choice)

No.	Question	Marks	CO No.	Level
2a	Convert the below LPP to standard form Minimize : 8 x+7y Subjected to: 4x+2y > =20 -6x+4y<=6 x+y>=4 2x-y=2 With non negativity constraint : x,y>=0 Ans: Z=-8x-7y -4x-2y < =-20 -6x+4y<=6 -x-y<=4 2x-y<=2 -2x+y<=-2	**5M**	**2**	**3**
2b	How does using the cross product help in determining if a point is in clockwise/counter clockwise from another point? Show with an example. **Answer:** Cross product of the two points is defined by p_1 x p_2 = the determinant of a matrix x_1 x_2 y_1 y_2	**5M**	**3**	**3**

	$= x_1y_2 - x_2y_1$ =the signed area of the parallelogram of four points:(0,0),p_1,p_2, p_1+p_2 • If p_1 x p_2 is positive then p_1 is clockwise from p_2 • If p_1 x p_2 is negative then p_1 is counterclockwise from p_2 Explanation : 3marks + Example diagram: 2 marks			
2c	A baker bakes two types of cakes: cake A and cake B. He requires for baking: Cake A – 1units of butter and 3 units of flour Cake B – 1units of butter and 2 units of flour Totally he has 5units of butter and 12 units of floor in store. He makes a profit of Rs 6 for each cake A sold and Rs 5 for each cake B sold. Given the above linear programming problem, determine the expressions for constraints and objective in order to maximize the profit. **Answer:** Objective: Maximize z=6x+5y Constraints : x+y<=5 3x+2y<=12 With non negativity constraint : x,y>=0	**5M**	**1**	**3**

PART- C

Total 20 Marks (Choice)

No.	Question	Marks	CO No.	Level
3a	Solve the below LPP using Simplex method. Maximize $3x_1+x_2$ Subject to: $x_1+x_2 \leq 30$ $2x_1+2x_2 \leq 24$ $4x_1+x_2 \leq 36$ With non negativity constraint : $x_1, x_2 \geq 0$ **Answer:** For x1=8 and x2=4 max of z=28	**10M**	**2,3**	**2,3**
	OR			
3b	Solve the below LPP using Simplex method. Maximize $2x_1+x_2+3x_3$ Subject to: $x_1+x_2+3\,x_3 \leq 36$ $2x_1+2x_2+5x_3 \leq 12$ $2x_1+x_2+4x_3 \leq 48$ With non negativity constraint : $x_1, x_2, x_3 \geq 0$ **Answer:** For x1=6 max of z=12	**10M**	**2,3**	**2,3**

4a	Apply Graham scan algorithm to find convex hull for the points : {(0,0), (4,4), (0,3), (1,2),(3,1),(3,3)} **Answer:** {(0,0),(3,1) ,(4,4) ,(0,3)}	**10M**	**2,3**	**2,3**
	OR			
4b	Design pseudo code/ program for checking whether a pair of line segments intersects or not. Apply the same to check line segment (p1,p2) intersects with(p3,p4). p1=(15,10) p2=(45,25), p3=(20,35) and p4=(30,10) Answer : Yes they intersect.	**10M**	**2,3**	**2,3**

1.a) Answer:

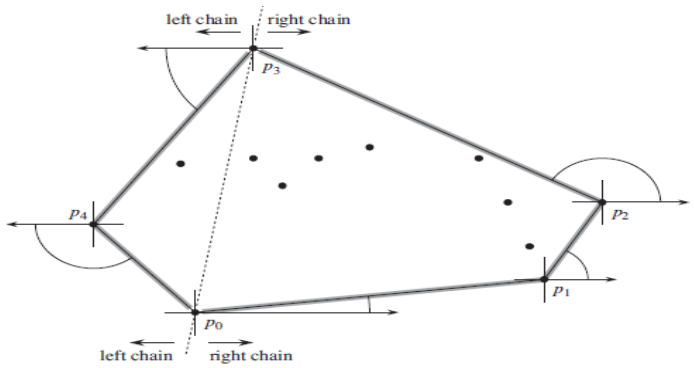

Figure 33.9 The operation of Jarvis's march. We choose the first vertex as the lowest point p_0. The next vertex, p_1, has the smallest polar angle of any point with respect to p_0. Then, p_2 has the smallest polar angle with respect to p_1. The right chain goes as high as the highest point p_3. Then, we construct the left chain by finding smallest polar angles with respect to the negative x-axis.

4.b) Answer:

```
SEGMENTS-INTERSECT(p1, p2, p3, p4)
 1  d1 = DIRECTION(p3, p4, p1)
 2  d2 = DIRECTION(p3, p4, p2)
 3  d3 = DIRECTION(p1, p2, p3)
 4  d4 = DIRECTION(p1, p2, p4)
 5  if ((d1 > 0 and d2 < 0) or (d1 < 0 and d2 > 0)) and
        ((d3 > 0 and d4 < 0) or (d3 < 0 and d4 > 0))
 6      return TRUE
 7  elseif d1 == 0 and ON-SEGMENT(p3, p4, p1)
 8      return TRUE
 9  elseif d2 == 0 and ON-SEGMENT(p3, p4, p2)
10      return TRUE
11  elseif d3 == 0 and ON-SEGMENT(p1, p2, p3)
12      return TRUE
13  elseif d4 == 0 and ON-SEGMENT(p1, p2, p4)
14      return TRUE
15  else return FALSE

DIRECTION(pi, pj, pk)
1  return (pk - pi) × (pj - pi)

ON-SEGMENT(pi, pj, pk)
1  if min(xi, xj) ≤ xk ≤ max(xi, xj) and min(yi, yj) ≤ yk ≤ max(yi, yj)
2      return TRUE
3  else return FALSE
```