Reg. No ..... Name **23157**

END SEMESTER EXAMINATION : NOVEMBER 2023

SEMESTER 1 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE AND DATA SCIENCE

COURSE : **21UP1CPCMT3 : MATHEMATICS - 1**

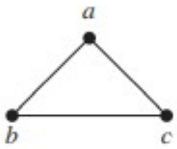
(For Regular 2023 Admission and Improvement / Supplementary -2022/2021 Admissions)

Time : Three Hours Max. Weightage: 30

PART A

Answer any 8

1. Draw all the spanning trees of the given simple graph.



2. Define Pseudographs.
3. Explain graphical method of solving an LP Problem.
4. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients B_1 and B_2. B_1 costs Rs.5 per kgand B_2 costs Rs.8 per kg. Strength considerations dictate that the brick should contain not more than 4 kg of B_1 and a minimum of 2 kg of B_2. The demand for the product is likely to be related to the price of the brick. Give linear programming model for the above problem to find the minimum cost of the brick.
5. When will we say that a transportation problem is balanced.
6. Define Huffman-coding algorithm.
7. Define multigraph with an example.
8. Draw the graph represented by the given adjacency matrix.

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 0 & 0 \\ 0 & 2 & 2 \end{bmatrix}$$

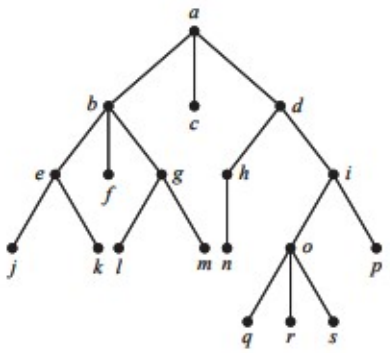
9. Define rim conditions in transportation problem.
10. Define left child and right child of a binary tree with example.

(1 x 8 = 8 Weight)

PART B

Answer any 6

11.



Answer these questions about the above rooted tree.
a) Which vertex is the root?
b) Which vertices are internal?
c) Which vertices are leaves?
d) Which vertices are children of j?
e) Which vertex is the parent of h?
f) Which vertices are siblings of o?
g) Which vertices are ancestors of m?
h) Which vertices are descendants of b?

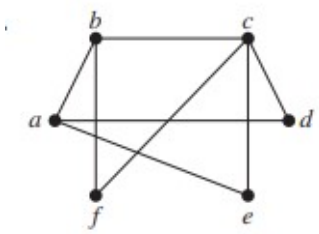
12. A company has factories at F_1, F_2, and F_3 which supply to warehouses at W_1, W_2 and W_3. Weekly factory capacities are 200, 160 and 90 units, respectively. Weekly warehouse requirement are 180, 120 and 150 units,respectively. Unit shipping cost (in rupees)are as follows:

	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	450

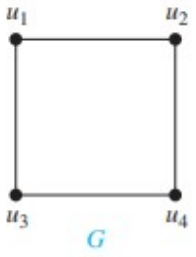
Use Vogel's Approximation Method to find an initial feasible solution to given transportation problem.

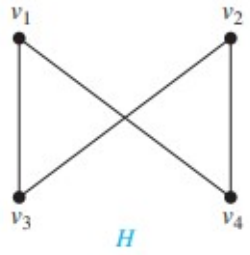
13. Determine whether these graphs are bipartite.If not, give reason.
a)

b)

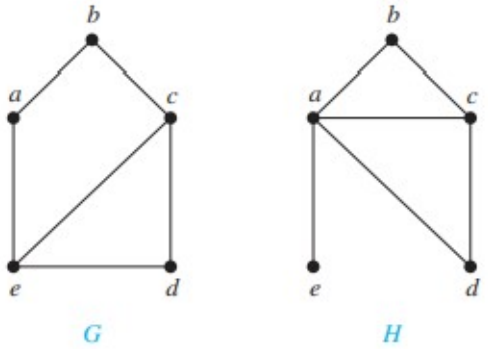


14. Prove that a full m-ary tree with i internal vertices contain *n = mi+1* vertices.
15. Expalin the procedures of preorder traversal,inorder traversal and postorder traversal.
16. Solve the following Linear programming problem graphically;
minimize: $z = 3x_1 + 2x_2$
subject to: $5x_1 + x_2 \geq 10$
$x_1 + x_2 \geq 6$
$x_1 + 4x_2 \geq 12$
$x_1 , x_2 \geq 0$
17. Check whether the following graphs are isomorphic or not.If not give reason
1)





2)



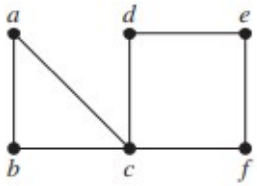
18. Define n-Cubes and draw the following;
a) Q_1 b) Q_2 c) Q_3

(2 x 6 = 12 weight)

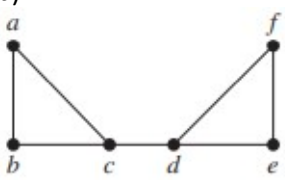
PART C
Answer any 2

19. (i) Show that in every simple graph there is a path from any vertex of odd degree. (ii)Find all cut vertices and cut edges of the given graphs.

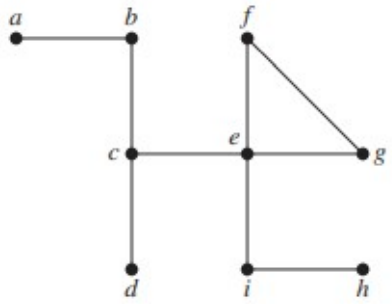
a)



b)



c)



20. Represent the expressions (x + xy) + (x/y) and x + ((xy + x)/y) using binary trees.
also write these expressions in
a) prefix notation.
b) postfix notation.
c) infix notation.

21. A department has five employees with five jobs to be performed. The time (in hours) each men will take to perform each job is given below;

		Employees				
		1	**2**	**3**	**4**	**5**
Jobs	**A**	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

22. Solve the following Linear programming problem using simplex method;
maximize: $z = 16x_1 + 17x_2 + 10x_3$
subject to: $x_1 + x_2 + 4x_3 \leq 2000$
$2x_1 + x_2 + x_3 \leq 3600$
$x_1 + 2x_2 + 2x_3 \leq 2400$
$x_1 \leq 30$
$x_1, x_2, x_3 \geq 0$

(5 x 2 = 10 weight)