

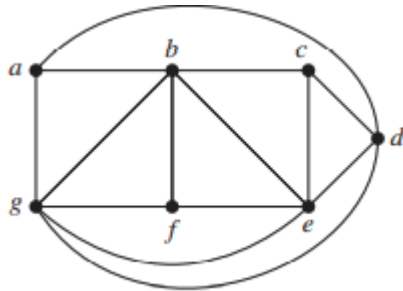
END SEMESTER EXAMINATION : NOVEMBER 2024
SEMESTER 1 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE AND DATA SCIENCE
COURSE : 21UP1CPCMT1 : MATHEMATICS - 1
(For Regular 2024 Admission and Improvement / Supplementary 2023/2022/2021 Admission)

Time : Three Hours

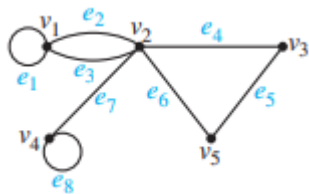
Max. Weightage: 30

PART A
Answer any 8

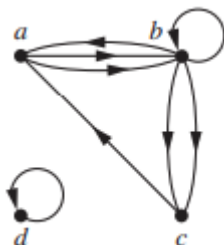
1. Define inorder traversal and Postorder traversal.
2. How to identify the solution obtained in MODI method is optimal or not?
3. Find a spanning tree for the graph shown by removing edges in simple circuits.



4. What is an unbounded solution, and how is this condition recognized in the graphical method?
5. What is degeneracy?
6. Represent the pseudograph using an incidence matrix



7. Determine the number of vertices and edges and find in-degree and out-degree of each vertex for the given directed multigraph



8. What are Isolated and Pendent vertex in a Graph.
9. Define ordered rooted tree.
10. Convert the following LP problem in to a standard LP problem by adding Slack, Surplus Or Artificial variables.

minimize: $z = 5x_1 + 3x_2$
 subject to: $2x_1 + 4x_2 \leq 12$
 $2x_1 + 2x_2 = 10$
 $5x_1 + 2x_2 \geq 15$
 $x_1, x_2 \geq 0$

(1 x 8 = 8 Weight)

PART B
Answer any 6

11. Prove that a full m -ary tree with
 1) n vertices has $i = (n-1)/m$ internal vertices and $l = [(m-1)n + 1]/m$ leaves,
 2) i internal vertices has $n = mi+1$ vertices and $l = (m-1)i + 1$ leaves,
 3) l leaves has $n = (ml-1)/(m-1)$ vertices and $i = (l-1)/(m-1)$ internal vertices.

12. Define wheel and Draw the following graphs;
 a) W_3 b) W_4 c) W_5 d) W_6

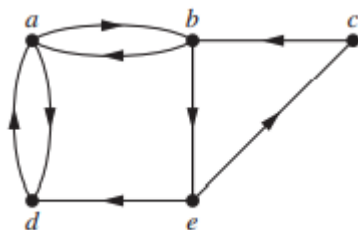
13. Solve the following Linear programming problem graphically;
 maximize: $z = 7x_1 + 3x_2$
 subject to: $x_1 + 2x_2 \geq 3$
 $x_1 + x_2 \leq 4$
 $x_1 \leq 5/2$
 $x_2 \leq 3/2$
 $x_1, x_2 \geq 0$

14. A department has five employees with five jobs to be performed. The time (in hours) each man 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

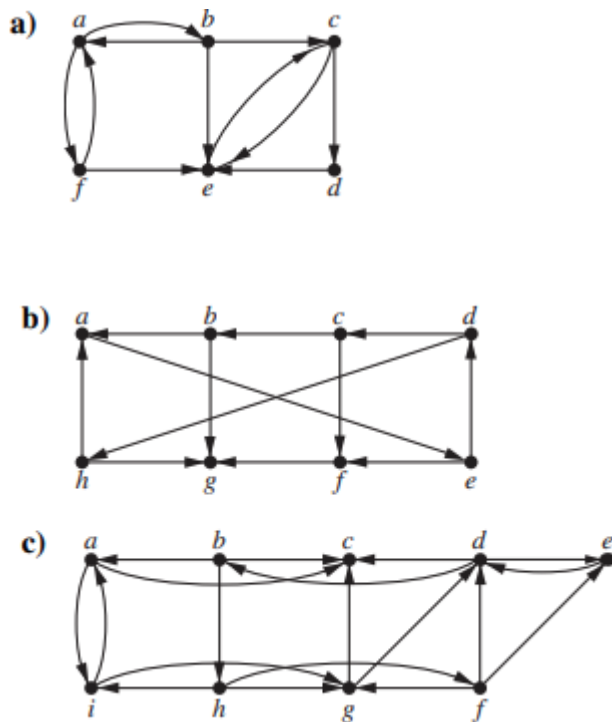
How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

15. Does each of these lists of vertices form a path in the following graph? Which paths are simple? Which are circuits? What are the lengths of these paths?
 a) a,e,b,c,b b) a,e,a,d,b,c,a
 c) e,b,a,d,b,e d) c,b,d,a,e,c



16. Form a binary search tree for the words mathematics, physics, geography, zoology, meteorology, geology, psychology, and chemistry (using alphabetical order).

17. Find the strongly connected components of each of these graphs.



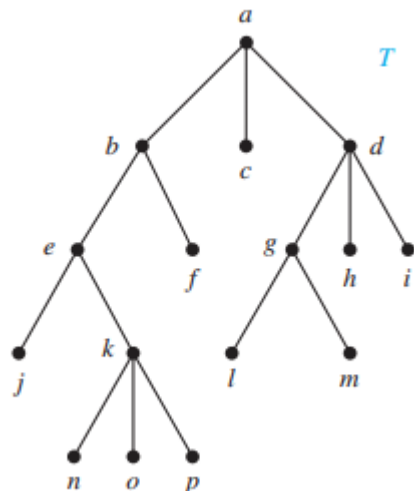
18. Construct the binary tree with prefix codes representing these coding schemes.

- a) a: 11, e: 0, t: 101, s: 100
- b) a: 1, e: 01, t: 001, s: 0001, n: 00001
- c) a: 1010, e: 0, t: 11, s: 1011, n: 1001, i: 10001

(2 x 6 = 12 Weight)

PART C
Answer any 2

- 19. Prove that A simple graph is bipartite if and only if it is possible to assign one of two different colors to each vertex of the graph so that no two adjacent vertices are assigned the same color.
- 20. In which order does a preorder traversal visit the vertices in the ordered rooted tree T shown below. Also give the same for inorder traversal and postorder traversal.



21. 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 Least Cost Method to find an initial feasible solution to given transportation problem.

22. Solve the following Linear programming problem using simplex method.

minimize: $z = -6x_1 - 4x_2$

subject to: $2x_1 + 3x_2 \leq 30$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0$$

(5 x 2 = 10 Weight)