

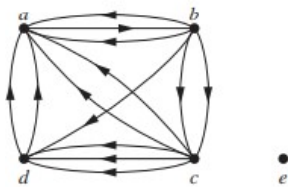
END SEMESTER EXAMINATION : OCTOBER 2022
SEMESTER 1 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE AND DATA SCIENCE
COURSE : 21UP1PCMT1 : MATHEMATICS - 1
(For Regular – 2022 Admission and Improvement / Supplementary - 2021 Admission)

Time : Three Hours

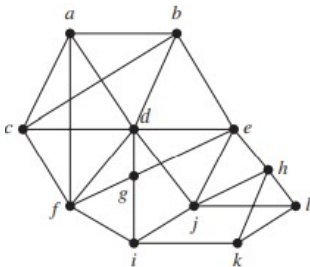
Max. Weightage: 30

PART A
Answer any 8

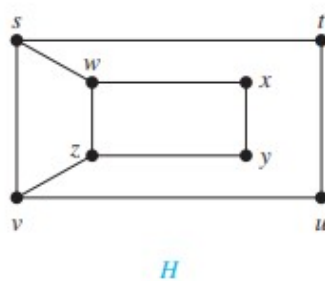
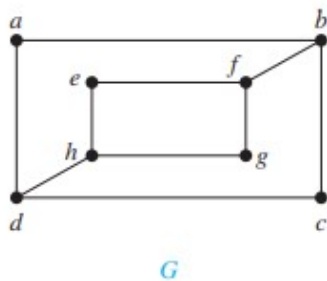
- Determine the number of vertices and edges and find in-degree and out-degree of each vertex for the given directed multigraph



- Find a spanning tree for the graph shown by removing edges in simple circuits.



- Show that the following graphs are not isomorphic.



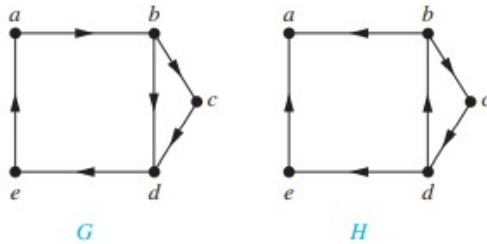
- Explain the procedure of preorder traversal.
- Which are the methods used for obtaining initial feasible solution in transportation problem.
- Define Huffman coding algorithm.
- Explain non-degenerate basic feasible solution.

8. What do you mean by an Influence graph?
9. What is mean by the term 'feasible region' in a LP problem?
10. What is an infeasible solution and how does it occur? How is this condition recognized in the graphical method?

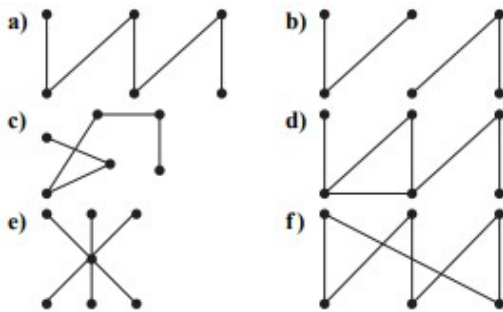
(1 x 8 = 8 Weight)

PART B
Answer any 6

11. Prove that an undirected graph is a tree if and only if there is a unique simple path between any two of its vertices.
12. Are the graphs G and H shown below are strongly connected? Are they weakly connected?



13. Which of these graphs are trees? If not give reason.



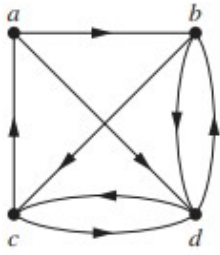
14. A company has three production facilities S_1 , S_2 and S_3 with production capacity of 7,9, and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D_1 , D_2 , D_3 and D_4 with requirement of 5, 6, 7 and 14 units (100s) per week, respectively. The transportation cost (in rupees) per unit between factories to warehouses are given in the table below:

	D_1	D_2	D_3	D_4	Capacity
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

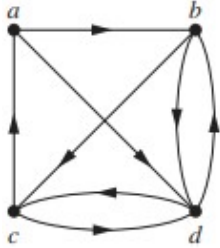
Formulate this transportation problem as an LP model to minimize the total cost.

15. Prove that A tree with n vertices has $n-1$ edges.
16. Determine whether the directed graph has an Euler circuit. Construct such a circuit when one exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such a path if one exists.

a)

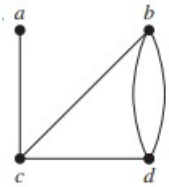


b)

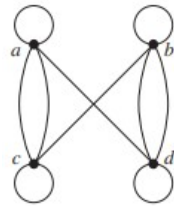


17. Represent the given graph using an adjacency matrix.

a)



b)



18. Use graphical method to solve the following LP Problem.

$$\begin{aligned} \text{minimize: } z &= 4x_1 + 4x_2 \\ \text{subject to: } x_1 + 2x_2 &\leq 10 \\ 6x_1 + 6x_2 &\leq 36 \\ x_1 &\leq 6 \\ x_1, x_2 &\geq 0 \end{aligned}$$

(2 x 6 = 12 Weight)

PART C
Answer any 2

19. Use the Simplex method to solve the Following LP Problem,

$$\begin{aligned} \text{Maximize } z &= 3x_1 + 5x_2 + 4x_3 \\ \text{subject to ; } 2x_1 + 3x_2 &\leq 8 \\ 2x_1 + 5x_3 &\leq 10 \\ 3x_1 + 2x_2 + 4x_3 &\leq 15 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

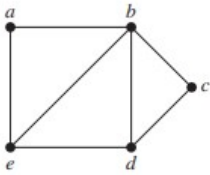
20. A department has five employees with five jobs to be performed. The time (in hours) each men will take to perform each job is given below;

		Employees				
Jobs		1	2	3	4	5
	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

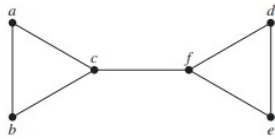
How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

21. Determine whether the given graph has a Hamilton circuit. If it does, find a circuit. If it does not, give an argument to show why no such circuit exists.

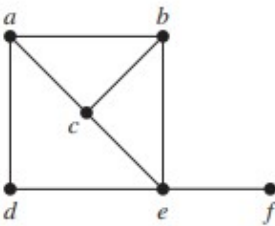
1)



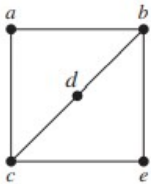
2)



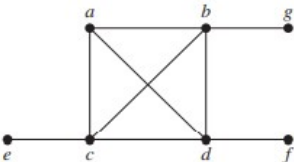
3)



4)



5)



22. Represent the compound propositions $\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$ and $(\neg p \wedge (q \leftrightarrow \neg p)) \vee \neg q$ using ordered rooted trees.

Also write these expressions in

- prefix notation.
- postfix notation.
- infix notation

(5 x 2 = 10 Weight)

