QP CODE: 24801161

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, FEBRUARY 2024

First Semester

INTEGRATED MSC COMPUTER SCIENCE-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING, INTEGRATED MSC COMPUTER SCIENCE-DATA SCIENCE

Complementary - ICSC1CM5 - MATHEMATICS I-GRAPH THEORY AND OPERATIONS RESEARCH

2020 Admission Onwards

FC9B910F

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What is a round-robin tournament? Draw a graph model for a round-robin tournament.
2. Define a self-complementary graph and draw a self-complementary graph with five vertices.
3. Define a) cut vertex b) cut edge.
4. What is a postorder traversal?
5. What is the postfix form of the expression ((x + y) ↑ 2) + ((x − 4)/3)?
6. Use depth-first search to find a spanning tree of K_5.
7. What is a constraint? Write the constraint for the situation: The number of tables can be atmost 20.
8. How do you convert a minimizing Linear Programming Problem (LPP) to a maximizing LPP?
9. What is the necessary and sufficient condition for the exixtence of a feasible solution to a transportation problem.
10. Obtain the initial basic feasible solution to the transportation problem using least cost method.

	D1	D2	D3	D4	Capacity
O1	1	2	3	4	6
O2	4	3	2	0	8
O3	0	2	2	1	10
Demand	4	6	8	6	24

(8×1=8 weightage)

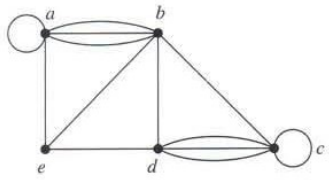
Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

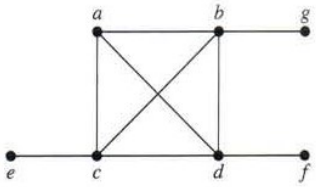
11. a) Find the number of vertices, the number of edges and the degree of each vertex in the given undirected graph.

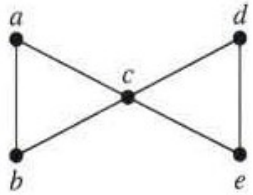
    b) If G is a simple graph with 15 edges and $\overline{G}$ has 13 edges, how many vertices does G have?



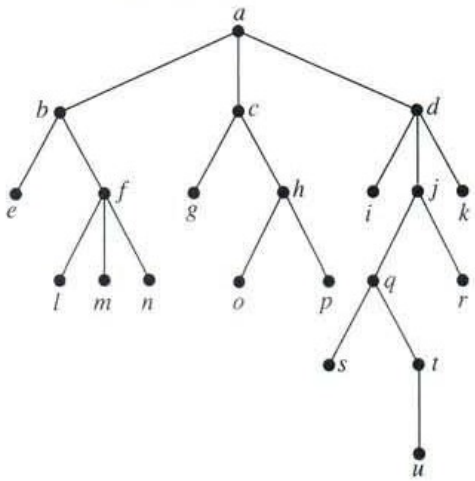
12. a) Determine whether the given graphs have Hamilton paths. If it does, find such a path. If it does not, give an argument to show why no such path exists.

    b) Determine whether the given graphs have a Hamilton circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists.





13. Identify the following from the given graph: a) root vertex b) internal vertices c) leaves d) children of j e) parent of h f) siblings of m g) ancestors of p h) descendants of c



14. Use Huffman coding to encode the following symbols with the frequencies listed: A: 0.08, B: 0.10, C: 0.12, D: 0.15, E: 0.20, F: 0.35. What is the average number of bits used to encode a character?

15. Convert the following LLP to its equivalent form using slack or surplus variables: Maximize Z=6x+4y subject to 4x+2y≤120; 2x+3y≤100; x,y ≥ 0.

16. Maximize Z=3x+5y subject to x-2y≤6; x≤10; y≥1 with non-negative conditions x,y ≥ 0.

17. A dairy farm has 3 plants located in a state.. The daily milk production and requirement at the each distribution is given in million litters. Cost of shipping of one million litter from each plant to each distribution centre is given in the following table. Find the initial basic feasible solution using North-West corner method and Vogel's approximation method.

		Distribution centre				
		D1	*D2*	*D3*	*D4*	*Supply*
Plant	*P1*	2	3	11	7	6
	P2	1	0	6	1	1
	P3	5	8	15	9	10
	Demand	7	5	3	2	

18. Explain the following terms in assignment problems.

    1. Balanced assignment problem
    2. An infeasible assignment

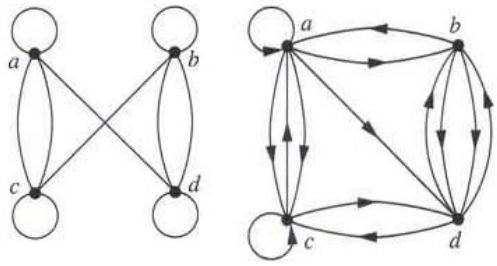
(6×2=12 weightage)

Part C (Essay Type Questions)

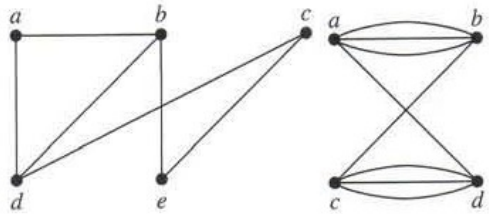
*Answer any **two** questions.*

*Weight **5** each.*

19. a) Write the properties of adjacency matrices and incidence matrices.
    b) Represent the following graphs with adjacency matrices.

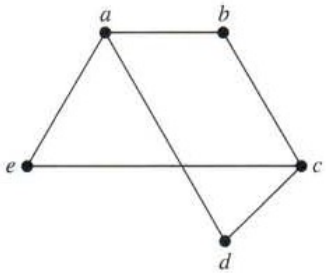


    c) Represent the following graphs with incidence matrices.



20. Use backtracking to find a) subsets, if it exists, of the set {27, 24, 19, 14, 11, 8} with each of the sums 20, 41, 60.

b) coloring of the given graph using three colors.



21. Maximize z = 3x, + 2y subject to 2x + y ≤ 2; 3x + 4y ≥ 12; x,y ≥ 0. Comment on the obtained result.

22. National Oil Company has 3 refineries and 4 depots. Transportation cost per ton, capacities and requirements are given below.

	D1	*D2*	*D3*	*D4*	*Capacity*
R1	5	7	3	10	700
R2	8	6	14	13	400
R3	12	10	9	11	800
Requirement	200	600	700	400	

Determine optimum allocation of output.

(2×5=10 weightage)