

Q.P Code D 123570	Total Pages 3	Name
		Register No.
SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025		
MATHEMATICS		
MAT2FM106 (1) Graph Theory and LPP		
2024 Admissions		
Maximum Time : 1.5 Hours		Maximum Marks : 50

Section A

All Questions can be answered. Each Question carries 2 marks (Ceiling : 16 Marks)

1	Define adjacent edges and isolated edges
2	Draw a longest cycle in the complete bipartite graph $K_{4,5}$
3	Let T be a tree with 25 vertices. Find its total number of edges
4	Draw a complete graph K_5 and find $\kappa(K_5)$.
5	Define cut vertex of a graph. Find the number of cut vertex in th complete bipartite graph $K_{7,1}$.
6	Graph the linear inequality $2x + 3y \leq 12$ and mark its boundary.
7	Graph the feasible region for the given system of inequalities. Write whether each region is bounded or unbounded. $x + y \leq 1$ $x - y \geq 2$
8	Write as linear inequalities. Identify all variables used: “Product A requires 3 hours on a machine, while product B needs 5 hours on the same machine. The machine is available for at most 60 hours per week.”.
9	Define slack variable. Give examples
10	For the linear programming problem given below, determine the number of slack variables needed, name them, and use slack variables to convert each constraint into a linear equation. Minimize $z = x_1 + 3x_2 - 4x_3$ subject to: $x_1 - 2x_2 - 2x_3 \leq 5$ $2x_1 - x_2 \leq 10$ $x_1, x_2, x_3 \geq 0$

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling : 24 Marks))

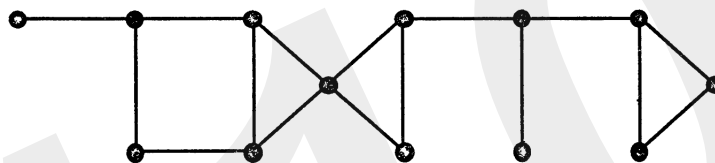
11	Show that “In any graph G there is an even number of odd vertices.”
12	Let G be a connected graph. (a) If G has 17 edges what is the maximum possible number of vertices in G ? (b) If G has 21 vertices what is the minimum possible number of edges in G ?
13	Let G be a graph with exactly one spanning tree. Prove that G is a tree.
14	Solve the following linear programming problem. Minimize $z = 2x + 4y$ subject to: $x + 2y \geq 10 \quad 3x + y \geq 10 \quad x, y \geq 0$
15	A health enthusiast wishes to mix two types of foods in his diet, in such a way that vitamin content of the mixture contains at least 10 units of vitamin B and 13 units of vitamin C. Food (F1) contains 1 unit/kg of vitamin B and 2 units/kg of vitamin C. Food (F2) contains 2 unit/kg of vitamin B and contains 1 unit/kg of vitamin C. F1 costs Rs 60/kg and F2 costs Rs 80/kg. Frame his diet plan making a linear programming problem in order to minimize the cost of the mixture.

Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks))

16	Solve by simplex method Maximize $z = 5x_1 + 2x_2$ subject to: $2x_1 + 5x_2 \leq 15 \quad 3x_1 + x_2 \leq 10 \quad x_1, x_2 \geq 0$
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Let G be the graph as given below

- (a) Find a closed walk of length 6. Is your walk a trail?
- (b) Find a closed trail of length 6. Is your trail a cycle?
- (c) What is the length of the longest cycle in G ?
- (d) What is the length of a longest path in G ?