



PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada-520010
Re-accredited at 'A+' by the NAAC

23MAMAL123: DISCRETE MATHEMATICS

Offered to: B.Sc. Hons (C.Sc., DS, DA, AI) **Course Type:** Major 4 (Core -TH)
Year of Introduction: 2023-24 **Year of offering:** 2023 - 2024
Semester: II 75 Hrs **Credits:** 4

Course Outcomes

S. No	At the end of the course the student will be able to	PO Mapping
	Upon successful completion of this course, students will be able to:	
CO1	Solve problems related to DNF and CNF.	PO1
CO2	Understanding the concepts related to counting & advanced counting.	PO6
CO3	Derive the generating function of a sequences.	PO7
CO4	Understand basic concepts of graphs.	PO2
CO5	Determine Euler and Hamiltonian paths and circuits in a graph.	PO7

CO-PO MATRIX							
CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2						
CO2						3	
CO3							1
CO4		2					
CO5							3

UNIT – I: MATHEMATICAL LOGIC

(15hrs)

1.1 Connectives, Negation, Conjunction, Disjunction, Conditional and Bi-Conditional statements.

1.2 Tautologies, Equivalence of formulae, Duality.

1.3 Tautological implications.

1.4 Disjunctive Normal Forms (using truth tables).

1.5 Conjunctive Normal Forms (using truth tables).

UNIT – II: COUNTING PRINCIPLES

(15hrs)

2.1 Basics of Counting.

2.2 Combinations and Permutations.

2.3 Enumeration of Combinations and Permutations.

2.4 Enumerating Combinations and Permutations with repetitions.

2.5 Enumerating Permutations with Constrained repetitions.

UNIT – III: RECURRENCE RELATIONS (15hrs)

3.1 Generating functions of sequences

3.2 Calculation coefficients of generating functions.

3.3 Recurrence relations.

3.4 Solving recurrence relations by substitution and generating functions.

UNIT – IV: GRAPHS (15hrs)

4.1 Graphs, Simple Graph, Multiple Graph, Undirected and Directed graph, degree of vertex, the Handshaking theorem.

4.2 Types of Graphs

4.3 Sub graphs and Isomorphism of graphs

4.4 Operations of graphs.

4.5 Adjacency and Incidence matrix

4.6 Paths, cycles, connectivity.

UNIT-V: CONNECTED GRAPHS (15hrs)

5.1 Connectedness in undirected graph

5.2 Connectedness in directed graphs

5.3 Eulerian graph, Eulerian trail, Eulerian Circuit, Euler Circuit, Euler path

5.4 Theorems on Eulerian graphs – related problems

5.5 Hamilton circuits, Hamilton path, Hamilton graph.

Unit I from prescribed book (2), remaining units from prescribed book (1).

TEXT BOOKS:

1. A Text Book of Discrete mathematics for computer scientists and mathematics, Joe L. Mott, Abraham Kandel, Theodore, Prentice – Hall of India Private Limited. 2nd Edition – 2009.
2. A Text Book of Discrete mathematics for computer scientists and mathematics, Joe L. Mott, Abraham Kandel, Theodore, Prentice – Hall of India Private Limited. Third Edition- 2006.

REFERENCE BOOKS:

1. A Text Book of Discrete Mathematics, Dr. Swapan Kumar Sarkar. S. Chand Publication, 2012.

Student Activities:

- 1) **Class-room activities:** Power point presentations, Assignments.
- 2) **Library activities:** Visit to library and preparation of notes for Assignment problems.
- 3) **Activities in the Seminars, workshops and conferences:** Participation/presentation in seminar/workshop/conference.

CO-CURRICULAR ACTIVITIES:

- Quiz Competitions, Seminars
- Group Discussions



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23MAMAL123: DISCRETE MATHEMATICS

SEMESTER – II

3hrs.

Max. Marks: 70

Time:

MODEL QUESTION PAPER

SECTION – A

(5 x 4 = 20 Marks)

Answer the following Questions

1.(a) Define Conjunction and Disjunction.

(CO1, L1)

(OR)

(b) Construct the truth table for $(\sim P)VQ$.

(CO1, L1)

2. (a) When two different dice are rolled, find in how many ways can we get a sum of 4 or 8? (CO2,L2)

(OR)

(b) Find the number of arrangements of the letters in the word TALLAHASSEE. (CO2,L2)

3. (a) Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + \dots)^5$. (CO3,L3)

(OR)

(b) Prove that $F_0 + F_1 + F_2 + \dots + F_n = F_{n+2} - 1$. (CO3, L3)

4.(a) Draw an undirected graph for the following adjacency matrix

$$\begin{bmatrix} 2 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}_{4 \times 4}$$

(CO4, L3)

(OR)

(b) State and prove Hand Shaking Theorem. (CO4, L3)

5.(a) Define Euler circuit and Hamiltonian circuit and give example of each. (CO5, L3)

(OR)

(b) Give an example of a graph which contains an Eulerian circuit that is also a Hamiltonian cycle. (CO5, L3)

SECTION – B

Answer the following Questions

(5 x 10 = 50 Marks)

6.(a) Prove that $[(p \wedge \sim q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$ is a tautology. (CO1, L3)

(OR)

(b) Obtain the DNF and CNF for $(P \rightarrow (Q \wedge R)) \wedge (\sim P \rightarrow (\sim Q \wedge \sim R))$ (CO1, L3)

7.(a) If $p(n,r)$ denotes the number of r permutations of n objects without repetitions, then prove that $p(n,r) = n!/(n-r)!$ (C O2, L3)

(OR)

(b) There are 30 females 35 males in the junior class, while there are 25 females and 20 males in the senior class. In how many ways can a committee of 10 be chosen so that there are exactly 5 females and 3 juniors on the committee. (CO2, L3)

8.(a) Solve $a_n - 5a_{n-1} + 6a_{n-2} = 0$, for $n \geq 2$ and $a_0=1, a_1=-2$. (CO3, L3)

(OR)

(b) State and prove explicit formula for Fibonacci numbers. (CO3,L2)

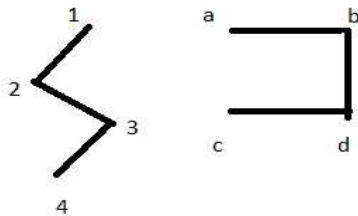
9. (a) (i) Prove that the degree of a simple graph G on n vertices cannot exceed $n-1$.

(ii) Prove that the maximum number of edges in a simple graph with n vertices is $n(n-1)/2$.

(CO4, L3)

(OR)

(b) Show that the two graphs shown in the figure are isomorphic



(CO4, L3)

10. (a) The minimum number of edges in a connected graph with n vertices is $(n-1)$. (CO5,L3)

(OR)

(OR)

(b) Give an example of a path which contains:

(i) An Eulerian circuit and a Hamiltonian cycle that are distinct.

(ii) An Eulerian circuit but not a Hamiltonian cycle.

(CO5,L3)