

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 ACTIVITES:

- Quiz Competitions, Seminars
- Group Discussions



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

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)

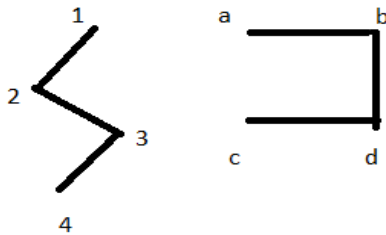
9. (a) (i) Prove that the degree of a simple graph G on n vertices cannot exceed $n-1$.

(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)

