

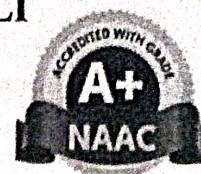
**SHRI GNANAMBICA DEGREE COLLEGE – MADANAPALLI
(AUTONOMOUS)**



B.C. A. Artificial Intelligence, B.C.A.(Honours) (Major)

SECOND YEAR-III SEMESTER

(W.E.F. Academic Year 2025-26)



COURSE 6: MATHEMATICAL AND STATISTICAL FOUNDATION

Theory

Credits: 3

3 hrs/week

Learning Outcomes

Upon successful completion of this course, the student will be able to:

- 1) Understand the concept of matrices and perform basic operations such as addition, subtraction, and multiplication of matrices.
- 2) Identify different types of matrices (e.g., symmetric, skew-symmetric, orthogonal, singular, non-singular) and understand their properties.
- 3) Compute the transpose, adjoint, determinant, and inverse of square matrices (up to order 3).
- 4) Determine the rank of a matrix and apply it in solving matrix-related problems.
- 5) Solve systems of linear equations using the matrix inversion method and Cramer's Rule (up to 3 variables).
- 6) Understand the fundamental concepts of set theory, including types of sets, operations on sets, and laws such as De Morgan's and distributive laws.
- 7) Interpret and construct Venn diagrams for visual representation of set operations and relations.
- 8) Organize and represent statistical data through classification and tabulation methods, including one-way and two-way frequency distribution tables.
- 9) Compute various statistical measures of central tendency, such as mean, median, mode, quartiles, deciles, and percentiles.
- 10) Apply empirical relationships among statistical averages, particularly the relationship between mean, median, and mode in a given data set.

UNIT-I

Matrix Algebra-I: Introduction, Definition of Matrix, Various types of Matrices, Addition of Matrices, Subtraction of Matrices, Multiplication of Matrices and their applications. Transpose of a Matrix, Symmetric Matrix, Skew Symmetric Matrix, Orthogonal Matrix, Singular Matrix, Non- Singular Matrix.

UNIT-II

Matrix Algebra- II: Determinant of a Matrix, Adjoint of a Square Matrix, Inverse of a Matrix up to 3 order only.

Solutions of Linear equations: 1. Matrix inversion method

2. Cramer's Rule upto 3 order only

UNIT-III

Set Theory: Definition of Set, Types of Sets, Union of Sets, Intersection of Sets, Venn diagrams, Operations on Sets, Complement of Set, Distributive Laws, De-Morgan's Laws.

Note:

1. Concentration on numerical problems only.
2. Proofs of theorems and Derivations are omitted.

UNIT-IV

Basics of Statistics: Classification, Tabulation, Frequency distribution table, One- way Frequency distribution table, Two-way Frequency distribution table.

UNIT-V


Statistical Measures: Measure of averages, Mean, Combined Arithmetic Mean, Median, Mode, Missing frequencies, Finding Median and Mode by graphical method, Empirical relationship between mean, median and mode.

Text Books:

Mathematical Methods by Dr.T.K.V.Ivengar, Dr.B.Krishna Gandhi, Dr.S.Ranganatham, and Dr.M.V.S.S.N. Prasad by S.Chand publications 6th revised edition 2011.

References:

1. Quantitative Techniques by C.Satyadevi by S.Chand Company
2. Statistical Methods by S.P. Gupta


M. K. S.


S. P. Gupta

D. Udaya Kumar
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Section - A

Answer any FOUR questions.

4X5=20


- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

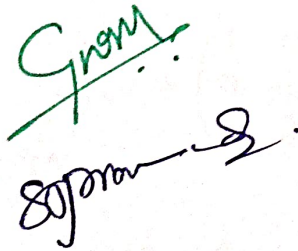
Section - B

Answer any five questions

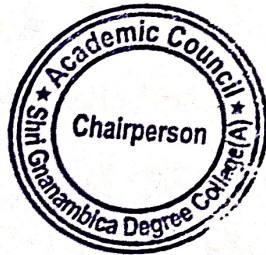
5X10=50

9. (a) Or (b)
10. (a) Or (b)
11. (a) Or (b)
12. (a) Or (b)
13. (a) Or (b)


M. Q. K.



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COURSE 6: MATHEMATICAL AND STATISTICAL FOUNDATION

Theory

Credits: 3

3 hrs/week

Model Question Paper
Section - A

Answer any **FOUR** questions.

4X5=20

1. Define symmetric and Skew-symmetric matrices with examples.
2. If $A = \begin{pmatrix} 0 & 2 & 0 \\ 1 & 0 & 3 \\ 1 & 1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ find $2A + 3B$, $3A - 2B$.
3. Find the determinant of the matrix $\begin{pmatrix} 1 & -1 & 2 \\ 3 & 0 & 4 \\ -4 & -2 & 5 \end{pmatrix}$
4. In a class of 100 students, 50 play hockey, 34 play basketball and 14 play both. How many students do not play either of the games.
5. What is meant by classification?
6. What are grouped data and ungrouped data of frequency distributions?
7. The mean of marks in statistics of 100 students in a class was 72. The mean mark of boys was 75, while their number was 70. Find out the mean marks of girls in the class.
8. Find mean, median and mode from the following data of heights in inches of a group of students: 61,62,63,61,64,64,60,65,63,64,65,66,64.

Section - B

Answer any **FIVE** questions

5X10=50

9. (a) If $A = \begin{pmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{pmatrix}$ then find the products AB and BA, and show that $AB \neq BA$.

Or

- (b) If $A = \begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \end{pmatrix}$, $B = \begin{pmatrix} -3 & 4 & 0 \\ 4 & -2 & -1 \end{pmatrix}$, verify (i) $(A')' = A$ (ii) $(A + B)' = A' + B'$.

- 10.(a) Solve the following linear equations by using Cramer's rule:

$$3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20.$$

Or

- (b) Solve the following linear equations by using Matrix inversion method:

$$x + y + z = 1, 2x + 2y + 3z = 6, x + 4y + 9z = 3.$$

11.(a) In a group of 300 students, 216 students study Hindi and 129 study Punjabi. How many study Hindi only? How many study Punjabi only and how many study both Hindi and Punjabi?

Or

(b) Let $U = \{1,2,3,4,5,6,7,8\}$, $A = \{3,4,5\}$, $B = \{4,5,6\}$. Show that $(A \cup B)' = A' \cap B'$.

12.(a) The marks scored by 40 candidates in an examination (out of 100) is given below:

75,65,57,50,32,54,75,67,75,88,42,40,41,34,78,43,61,42,46,68,52,43,49,59,49,67,34,33,87,97,47,46,54,48,45,51,47,41,43.

Prepare a frequency table with the class size 10. Take the class intervals (30-39), (40-49) and the following questions.

(i) Which class intervals have the highest and lowest frequency?

(ii) Write the upper and lower limits of the class interval 30-39.

Or

(b) Two dice are thrown at random. Obtain the frequency distribution of the sum of the numbers which appear on them.

13.(a) 100 students appeared for an examination. The results of those who failed are given below:


Marks	5	10	15	20	25	30
No. of Students	4	6	8	7	3	2

If the average marks of all students were 68.6, find out average marks of those who passed.

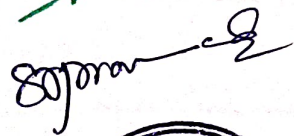
Or

(b) The frequency distribution of weight in grams of mangoes of a given variety is given below. Calculate the arithmetic mean and the median.

Weight in grams	410-419	420-429	430-439	440-449	450-459	460-469	470-479
No. Of mangoes	14	20	42	54	45	18	7


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