D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1. DEPARMENT OF MATHEMATICS MATHEMATICAL FOUNDATION II-B.C. A -15CCA3A

UNIT-I SET THEORY 2 MARKS

- 1. Define set with example.
- 2. Define finite and infinite sets.
- 3. Define description of set.
- 4. Define singleton set with example.
- 5. Define null set with example.
- 6. Define equality of set.
- 7. Define disjoint set with example.
- 8. Define universal set with example.
- 9. Define union of set with example.
- 10. Define intersection of set with example.
- 11. Define difference of sets.
- 12. Define complement of set with example.
- 13. Let $A=\{a,b,c\}, B=\{1,2\}$

 $A \times B = \{(a, 1), (a, 2), (b, 1), (b, 2), (c, 1), (c, 2)\}$

 $B \times A = \{(1,a), (2,a), (1,b), (2,b), (1,c), (2,c)\}$

Prove $A \times B \neq B \times A$

- 14. Define Cartesian product.
- 15. If A= $\{1,2,3\}$ B= $\{3,4,5\}$ find A×B and B×A
- 16. If A×B={(1,3),(1,4),(1,5),(2,3),(2,4),(2,5),(3,3),(3,4) find A and B values.
- 17. Define relation with example.
- 18. Define identity relation.
- 19. Define inverse relation with example.
- 20. Define reflexive relation with example.
- 21. Define symmetric relation with example.
- 22. Define transitive relation with example.
- 23. Define equivalence relation.
- 24. Define ordered pair.
- 25. Define function.
- 26. Define mapping with example.
- 27. Define co-domain.
- 28. Define image of a under f.
- 29. Define range.
- 30. Define onto function with example.
- 31. Define one to one function with example.
- 32. Define into function.
- 33. Define many to one function with example.
- 34. Define constant function with example.
- 35. Define identity function example.

36. Define composition function with example.

37. Let f be the function from $R \rightarrow R$ defined by $f(x) = x^2$ and g be the function from

 $R \rightarrow R$: g(x) =x+5. Prove that $f \circ g = g \circ f$.

38. Let X={1,2,3,4}, Y={5,7,9,11,12} and let $f:X \rightarrow Y$ be defined f(x)=2x+3. Represent f as

(i) A set of ordered pairs

(ii)An arrow diagram.

39. If
$$f(x) = \frac{1}{x}$$
; $f(x) = x^2 + 1$, find $f \circ g$ and $g \circ f$.

SECTION-B 5 MARKS

1. If
$$f(\mathbf{x}) = \frac{1}{x}$$
; $f(\mathbf{x}) = x^2 + 1$, find $f \circ g$ and $g \circ f$.

2. If X={x:1<x≤5, x is a prime} find the range if f(x) $\neq \frac{x-1}{x+1}$

3. If X={4,6,8,10}, Y={3,4,5,6,7} and f: X \rightarrow Y given by f(x) = $\frac{x}{2}$ +1. Represent f is an arrow diagram and as a set of ordered pairs.

4. If $f(x) = x^2 + 1$ and g(x) = x + 1 find $f \circ g$ and $g \circ f$.

5. If f(x) = 2x+3 and g(x)= 5x+m, find m so that $f \circ g = g \circ f$.

6. Which of the following sets of ordered pairs are functions from A= $\{2,0,3,4\}$, B= $\{5,7,9\}$

and specify their types

- a) $\{(-2,9),(0,5),(2,5),(4,7)\}$ b) $\{(-2,5),(0,7),(3,7),(4,9)\}$ c) $\{(-2,7),(0,5),(0,7),(4,5)\}$ d) $\{(-2,5),(0,7),(3,7)\}$
- e) $\{(0,9), (-2,9), (3,9), (4,9)\}$

7. f(x) = x+3, g(x) = 2x+7 and $h(x) = x^2$ check whether $(f \circ g) \circ h = f \circ (g \circ h)$.

8. f: $R \rightarrow R$, g: $R \rightarrow R$ and h: $R \rightarrow R$; f(x)=2x, g(x)=3x-1 and h(x)= $x^2 + 3$. Show that

 $(f \circ g) \circ h = f \circ (g \circ h).$

9. Does the following diagram represent a function, why?



- 10. Verify venn diagram $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
- 11. Verify venn diagram $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
- 12. Verify venn diagram $(A \cup B)' = A' \cap B'$
- 13. Verify venn diagram $(A \cap B)' = A' \cup B'$
- 14. Verify venn diagram A' B' = B A

15. State and prove distributive law.

16. State and prove Demorgan law.

17. If n(A) denotes the number of elements in the set A. Show that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ hence show that $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$. 18. If A={1,2,3}, B={1,3,5}, C={2,3,4,6} Find (i) $(A \cup B)$ (ii) $(A \cap B)$ (iii) A-B (iv) $A \cup (B \cap C)$ (v) A-B \cap C. 19. U={1,2,3,4,5,6,7} A={1,2,3,4,5,6,7} C={2,5,6,7}, Find (i) $(A \cup B)$ (ii) $(B \cap A)$ (iii) C-B (iv) $C' \cap A$. 20. If A={1,4}, B={4,5}, C={5,7} Find (a) $(A \times B) \cup (A \times C)$ (b) $(A \times B) \cap (A \times C)$. 21. If A={1,2,3}, B={2,3,4}, S={1,3,4}, T={2,4,5} Verify that $(A \times B) \cap (S \times T) = (A \cap S) \times (B \cap T)$.

21. Prove that

(i)
$$A - (B \cap C) = (A - B) \cup (A - C)$$

(ii) $A - (B \cup C) = (A - B) \cap (A - C)$.

SECTION-C 10 MARKS

- 1. State and prove De-morgan's law.
- 2. State and prove Distributive law.
- 3. Prove that (i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(ii)
$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

4. Prove that (i) $(A \cup B)' = A' \cap B'$

(ii)
$$(A \cap B)' = A' \cup B$$

5. Prove that (i) $[A' \cup (A \cap B')]' = A \cap B$

(ii)
$$\left[(A' \cup B')' \cup (A' \cup B') \right] = A$$

(iii) $A \cup B = (A \cap B) \cup (A \cap B)' \cup (A' \cap B).$

6. In a survey of 5000 persons, it was found that 2,800 read Indian express and 2,300 read Statesman while 400 read both papers. How many read neither Indian express or Statesman?

7. In a city three daily newspapers A,B,C are published 42% of the people in the city read A; 51% read B; 68% read C; 30% read both A and B; 28% read B and C; 36% read A and C; 81% do not read any of the three newspapers. Find the percentage of persons who read all the 3 newspapers?

8. Out of 680 boys in a school, 224 played cricket, 240 played hockey and 36 played basket ball; of the total 64 played both basketball and hockey; 80 played cricket and basketball and 40 played cricket and hockey. 24 played all the three games. How many did not play any of the games and how many played only one game?

9. Out of a group of 50 teachers in a high school 30 teach Mathematics, 20 teach English and 25 teach Science. 10 teach both Mathematics and Science, and none teach Mathematics and English

- (i) How many teach science and English?
- (ii) How many teach only English?

UNIT-II MATRIX 2 MARKS

- 1. Define Matrix.
- 2. Define equal matrix with example.
- 3. Define diagonal matrix with example.
- 4. Define scalar matrix.
- 5. Define unit matrix.
- 6. Define null matrix.
- 7. Define row matrix.
- 8. Define column matrix.
- 9. Define transpose of a matrix.
- 10. Define singular matrix.
- 11. Define non-singular matrix.
- 12. Define scalar multiplication.
- 13. Define addition of the matrix.
- 14. Define subtraction of the matrix.
- 15. Define multiplication of two matrices.
- 16. Define determinant of a matrix.
- 17. Define adjoint of a square matrix.
- 18. Define inverse of a matrix.

19. Find A =
$$\begin{vmatrix} 2 & 3 & 1 \\ 4 & 1 & 2 \\ 3 & 0 & 4 \end{vmatrix}$$

20. Show that A= $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 4 \\ 2 & 4 & 6 \end{bmatrix}$ verify that A is singular matrix.

21. Show that A is a non-singular matrix.

$$\mathbf{A} = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$

22. Define symmetric matrix with example.

23. Define skew-symmetric matrix with example.

24. Define Hermitian matrix.

25. Define skew-Hermitian matrix.

26. If
$$A = \begin{bmatrix} 0 & i & 2 \\ -i & 2 & -2+1 \\ 2 & -2-i & 1 \end{bmatrix}$$
 show that A is hermitian.

27. Define orthogonal matrix with example.

28. Define unitary matrix.

29. Find the rank of the matrix.

$$\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & -4 \\ -3 & 1 & -2 \end{bmatrix}$$

30. Find the rank of the matrix

 $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$



7. If A=
$$\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$$
, prove that A(adj A)= $|A|$ I.

8. Find the inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 2 & 1 \\ 1 & 1 & -2 \end{bmatrix}$

- 9. Solve the equations:
 - 2x+4y+z=5 x+y+z=6 2x+3y+z=6
- 10. Solve the equation by Cramer's rule

$$x+2y=2+z$$

$$3x+2z=1+4y$$

$$x+z+4=3y$$
11. If A= $\begin{bmatrix} 1 & -1 & 2\\ 3 & 0 & 1\\ 1 & -1 & 0 \end{bmatrix}$, Prove that A+ A^T is a symmetric and A- A^T is skew-symmetric.

12. Prove that
$$\frac{1}{7}\begin{bmatrix} 6 & -3 & 2 \\ -3 & -2 & 6 \\ 2 & 6 & 3 \end{bmatrix}$$
 is a orthogonal matrix.

13. Show that the matrix A=
$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ \frac{-i}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{bmatrix}$$
 is unitary.

SECTION-C 10 MARKS

1.If
$$A = \begin{bmatrix} 2 & -3 \\ 3 & 1 \end{bmatrix}, B = \begin{bmatrix} 4 & 2 \\ 2 & 5 \end{bmatrix}, C = \begin{bmatrix} 1 & 3 \\ 3 & -2 \end{bmatrix}$$

(i) Verify that A(BC)=AB(C)
(ii) (A+B)C=AC+BC.
2. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ show that $A^2 - 4A - 5I = 0$ and also find A^{-1} .
3. $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ verify that (adj A)A = A(adj A) = |A|I
4. Find inverse of A, $A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & 5 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and verify that $A(A^{-1}) = A^{-1}(A) = I$

5. Solve the equation x+y+2z=4

6. Solve the equation by Cramer's rule

7. Prove that the following matrix is unitary

$$\begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$$

8.Solve
$$1/3 \begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$$
 by orthogonal matrix

UNIT-III STATISTICS 2 MARKS

- 1. Define Statistics.
- 2. Write about the scope of statistics.
- 3. Define data.
- 4. Write about the limitations of statistics.
- 5. Define primary data.
- 6. Define secondary data.
- 7. Define classification of data.
- 8. Define qualitative classification.
- 9. Define quantitative classification.
- 10. Define geographical classification.
- 11. Define chronological classification.
- 12. Define caption.
- 13. Define head note.
- 14. Define source note.
- 15. Define foot note.
- 16. Define diagrammatic.
- 17. Define line diagram.
- 18. Define bar diagram.
- 19. Define simple bar diagram.
- 20. Define multiple bar diagram.
- 21. Define sub divided bar diagram.
- 22. Define pictogram.
- 23. Define cartogram.
- 24. Define pie-diagram.
- 25. Define histogram.
- 26. Define frequency polygon.
- 27. Define frequency curve.
- 28. Define O' gives curve.

SECTION-B 5 MARKS

- 1. Explain about the classification of data and its types.
- 2. Explain about the types of diagram with example.
- 3. Draw a simple bar diagram for the following data:

Year:	1997	1998	1999	2000	2001	2002

Profit:	15,000	20,000	16,000	13,000	18,000	17,000
	/	/	,	/	/	,

4. Draw a multiple bar diagram for the following data:

Year:	2000	2001	2002	
Profit A:	10,000	8,000	13,000	
Profit B:	15,000	14,000	13,000	

5. Draw a subdivided bar diagram for the following data:

Items	Rice	Quantity	Value	Expenses	Profit
А	3	75	175	30	20
В	2	100	150	25	25

6. Draw a pie-diagram for the following data:

Items	Food	Clothing	Recreation	n Edu	lcation	Rent	Others
Expenditure	87	24	11		13	25	20
7. Draw a hist	ogram fo	or a followir	ng data:				
Wages 70	0-10) 10-20	20-30	30-40	40-50	50-60	60-
No. of workers	5	8	10	14	11	6	3

UNIT-IV

MEASURES OF CENTRAL TENDENCY (OR) AVERAGE

SECTION-A 2 MARKS

- 1. Define Average and its types
- 2. Write the formula for simple arithmetic mean
- 3. Define Arithmetic mean
- 4. Find the Arithmetic mean for the following data: 25,32,28,34,31,36,27,29,30
- 5. Define Median
- 6. Find the Median for the following data: 14,100,14,150,160,80,17120,15200,16160,17400
- 7. Define Mode
- 8. Define Geometric Mean
- 9. Define Harmonic Mean
- 10. Rate of a certain commodity of all in a first week of a January is 4 and second week of a January is 0.6 and 3 week of a January is 0.5. What is Average price?
- 11. An automobile driver travels a hill station 100 km distance and then average speed of 30 km per hour then he makes return trip at average speed of 20 km per hour. What is the average speed of entire distance?
- 12. If Median is 20.6 and Mode is 26. Find out Mean?
- 13. If Mode is 32.1 and mean are 35.4. Find out the Median?
- 14. Calculate mode 10,27,24,12,27,20,18,15,30

SECTION-B 5 MARKS

1. Find the Arithmetic Mean:

Age(x)	8	10	12	15	18
Number of	5	7	12	6	8
works(F)					

2. From the following data find out the Mean profit:

Profit	100-	200-	300-	400-	500-	600-	700-
	200	300	400	500	600	700	800
No. of	10	18	20	26	30	28	18
works							

3. Calculate Median:

Х	10	20	30	40	50
F	7	8	12	4	3

4. Find out missing value for the following distribution whose Mean is 31.8

Х	12	20	27	33	х	54
F	18	16	48	90	30	8

5. Calculate Mode

Size	10	11	12	13	14	15	16	17	18
Frequency	10	12	15	19	20	8	4	3	2

- 6. The Mean age of 100 persons was found to be 32.02. Later it was discovered that age 57 is read as 27. Find out the correct Mean.
- 7. The Mean weight of 150 students in a class is 60 kg than the mean weight of boys in the class is 70 kg and girls are 55 kg. Find the no. of girls in the class.
- 8. Calculate Geometric Mean:

Х	12	13	14	15	16	17
F	5	4	4	3	2	1

9. Calculate Harmonic Mean:

Size	6	7	8	9	10	11
Frequency	4	6	9	5	2	8

10 MARKS:

1. Find the Mean

Class	0-9	10-19	20-29	30-39	40-49	50-59	60-90
Interval							
Frequency	5	8	10	14	11	6	3

2. Calculate Median

Marks	45-	40-	35-	30-	25-	20-	15-	10-	5-10
	50	45	40	35	30	25	20	15	
No. of	10	5	26	30	42	31	24	15	7
students									

3. Find the missing Frequency $\overline{X} = 1.46$

Х	0	1	2	3	4	5
Frequency	46	\mathbf{F}_1	F_2	25	10	5

4. Calculate Mode from the following data:

Weight	93	98-	103-	108-	112-	118-	123-	128-
	-97	102	107	112	117	122	127	132
No.of	2	5	12	17	14	6	3	1
students								

5. Calculate Geometric Mean and Harmonic Mean

Marks	10-20	20-30	30-40	40-50	50-60
Frequency	5	7	10	6	8

UNIT V MEASURES OF DISPERSION 2 MARKS

- 1. Define range and Co-efficient of range
- 2. Define quartile derivation
- 3. Find range and co-efficient of range for the following data 35,40,52,29,51,46,27,30,32,33
- 4. What are the merits and demerits of quartile derivation
- 5. Define standard deviation and co-efficient of standard deviation

SECTION-B 5 MARKS

1. Find the range and Co-efficient of range

Marks	10	20	30	40	50	60
No. of.	1	2	3	4	5	6
students						

2. Find the range and co-efficient of range

Class Interval	0-10	10-20	20-30	30-40
frequency	3	6	9	11

- 3. Calculate the value of quartile deviation and co-efficient of quartile deviation 20,28,40,12,30,15,50
- 4. Find mean deviation about mean and co-efficient of mean deviation about mean for the following data 18,20,12,14,19,22,26,16,19,24
- 5. Find standard deviation (or) assumed mean or step deviation 26,24,29,22,30,19,24,28,26,30

10 MARKS

1. Find the quartile deviation, quartile range and co-efficient of quartile deviation

Marks	10	20	30	40	50	60
No. of	4	7	15	8	7	2
Students						

2. Calculate quartile range, quartile deviation and co-efficient of quartile deviation

Class	0-10	10-20	20-30	30-40	40-50
Interval					
frequency	4	15	28	16	7

3. Find Mean deviation from mean and co-efficient of mean deviation from mean

Х	20	18	16	14	12	10	8	6
F	12	4	9	12	27	25	14	1

4. Find mean deviation about Mean, Median, Mode and co-efficient of mean deviation about Mean, Median, Mode

Х	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
F	18	16	15	12	10	5	2	2

5. Find standard deviation and co-efficient of standard deviation

Х	10	11	12	13	14
F	3	12	18	12	3

6. Find standard deviation and co-efficient of standard deviation

Salary	75	80	85	90	95	100
Workers	3	7	18	12	6	4