Workbook Cum Question Bank with Answers

Business Mathematics and Statistics

CLASS-XII (COMMERCE)

SCHEDULED CASTES & SCHEDULED TRIBES
RESEARCH & TRAINING INSTITUTE (SCSTRTI)
ST & SC DEVELOPMENT DEPARTMENT
BHUBANESWAR

BUSINESS MATHEMATICS AND STATISTICS

WORKBOOK-CUM-QUESTION BANK WITH ANSWERS

CLASS - XII (CHSE)

COMMERCE

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Contents

GROUP - A

UNIT-I

I. Multiple Choice Questions:

Matrix

1. A square matrix in which all the principal diagonal elements are non-zeroes and all other elements are zeroes is a :
   (i) Square matrix
   (ii) Scalar matrix
   (iii) Diagonal matrix
   (iv) unit matrix

2. A matrix that appears with equal number of rows and columns is a:
   (i) Row matrix
   (ii) Diagonal matrix
   (iii) Column matrix
   (iv) Square matrix

3. A matrix that consists of only zeroes is a :
   (i) Unit matrix
   (ii) Null matrix
   (iii) Sub matrix
   (iv) Singular matrix.

4. A square matrix the determinant of which is zero is a:
   (i) Singular matrix
   (ii) Non- singular matrix
   (iii) Null matrix
   (iv) Identity matrix.

5. A small matrix obtained by deleting some rows or some columns of a given matrix is a :
   (i) Equal matrix
   (ii) Sub Matrix
   (iii) Triangular matrix
   (iv) Adjoint matrix

6. if all the elements of a matrix are equal to the corresponding elements of another matrix they are said to be:
   (i) Equivalent matrices
   (ii) Equal matrices
   (iii) Sub matrices
   (iv) Symmentric matrixes.

7. A Square matrix the determinant of which is not zero is a:
   (i) Symmetric matrix
   (ii) Non-singular matrix
   (iii) Orthogonal matrix
   (iv) Singular matrix

8. When one matrix is multiplied by another matrix it is called:
   (i) Scalar multiplication
   (ii) Multiplication proper
   (iii) Association
   (iv) Cross multiplication

9. If the number of rows and columns of a matrix are equal to those of another matrix, then they are :
   (i) Equal matrices
   (ii) Equivalent matrices
   (iii) Symmetric matrices
   (iv) Sub matrices.

10. $(3, 4, 5) \times \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}$ is equal to

    (i) 18 (ii) 20
    (iii) 38 (iv) 48

11. If a matrix of the order 3 x 2 is multiplied by another matrix of the order 2 x 2, then the resultant matrix will be of the order:

(i) 3 x 2 (ii) 2 x 2

(iii) 2 x 3 (iv) 3 x 3

12. The product of the matrix and its inverse must result in a :

(i) Diagonal matrix

(ii) Unit matrix

(iii) Row matrix

(iv) Singular matrix

13. If $A = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ then A + B is :

(i) $\begin{pmatrix} 7 & 6 \\ 11 & 8 \end{pmatrix}$ (ii) $\begin{pmatrix} 5 & 8 \\ 7 & 12 \end{pmatrix}$

(iii) $\begin{pmatrix} 7 & 9 \\ 11 & 13 \end{pmatrix}$ (iv) $\begin{pmatrix} 13 & 11 \\ 9 & 7 \end{pmatrix}$

14. The matrix obtained by changing the rows and columns of a matrix is called :

(i) Inverse Matrix

(ii) Adjoint Matrix

(iii) Transpose Matrix

(iv) Singular Matrix

15. If A is a symmetric matrix then :

(i) $A^t = -A$ (ii) $A = A^t$

(iii) $A = A^{-1}$ (iv) $A = -A$

16. If A is a 2x2 matrix whose elements are given by . $a_{i+j} = i + j$ then A is :

(i) $\begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$ (ii) $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$

(iii) $\begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$ (iv) $\begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix}$

17. If transpose of a matrix is the matrix itself then the matrix is a :

(i) Adjoint matrix

(ii) Symmetric matrix

(iii) Inverse matrix

(iv) Unit matrix

18. If $\begin{pmatrix} x-y & z \\ 2x-y & w \end{pmatrix} = \begin{pmatrix} -1 & 4 \\ 0 & 5 \end{pmatrix}$ then the respective values of x,y,z and *w* are:

(i) 1. 2. 3. 4 (ii) 1, 2, 4, 5

(iii) 1, 2, 3, 5 (iv) 1, 1, 4, 5

19. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is not a :

(i) Identity matrix

(ii) Diagonal matrix

(iii) Square matrix

(iv) Zero matrix

20. Multiplication of two matrices is possible if both has :

(i) Equal number of rows.

(ii) Equal number of columns.

(iii) The col. number of the first must be equal to the row number of the 2nd matrix.

(iv) The row number of the first must be equal to the column number of the 2nd matrix.

Determinant

21. If $|A| = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$, the minor of a_{13} is :

(i) $\begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix}$ (ii) $\begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{32} \end{vmatrix}$

(iii) $\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$ (iv) $\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$

22. If $|A| = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$ the cofactor of a_{11} is

(i) a_{12} (ii) $-a_{21}$

(iii) $-a_{12}$ (iv) a_{22}

23. If any two rows or columns of a determinant are identical the value of the determinant is:

(i) 1 (ii) 0

(iii) - 1 (iv) ∞

24. If $|A| = \begin{vmatrix} 2 & -5 & 3 \\ 3 & -1 & 2 \\ 2 & -2 & 1 \end{vmatrix}$ then numerical value of the minor of the element -5 is :

(i) 1 (ii) 0

(iii) - 5 (iv) - 1

25. If any two adjacent rows or columns of a determinant are inter changed the numerical value of the determinant :

(i) Changes

(ii) Remain same

(iii) remain same but with opposite sign

(iv) changes along with the sign.

26. If a determinant is transposed its numerical value:

(i) Changes

(ii) Remains Unchanged

(iii) Remain same but with opposite sign

(iv) Becomes Zero

27. $\begin{vmatrix} 3 & 5 \\ 4 & 6 \end{vmatrix} + \begin{vmatrix} 1 & 5 \\ 2 & 6 \end{vmatrix}$ is equal to :

(i) $\begin{vmatrix} 4 & 10 \\ 6 & 12 \end{vmatrix}$ (ii) $\begin{vmatrix} 4 & 5 \\ 6 & 6 \end{vmatrix}$

(iii) $\begin{vmatrix} 8 & 1 \\ 10 & 2 \end{vmatrix}$ (iv) $\begin{vmatrix} 2 & 1 \\ 8 & 5 \end{vmatrix}$

28. The value of $\begin{vmatrix} 2 & 8 & 2 \\ 4 & 9 & 4 \\ 3 & 10 & 3 \end{vmatrix}$ is equal to :

(i) 40 (ii) 1

(iii) 0 (iv) 30

29. If $\begin{vmatrix} x & 6 \\ 10 & 5 \end{vmatrix} = 0$, then the value of x is

(i) 0 (ii) 1

(iii) 5 (iv) 12

30. The co factor of an element a_{11} is :

(i) $(-1)^3 M_{12}$ (ii) $(-1)^2 M_{11}$

(iii) $(1)^2 M_{21}$ (iv) $(-1)a_{22}$

Set theory

31. If A C B and B C A then A and B are:

(i) Disjoint sets

(ii) Null sets

(iii) Equal sets

(iv) Complementary sets.

32. A set which is subset of every set is a:
(i) Singleton set
(ii) Null set
(iii) Equal set
(iv) Proper Subset.

33. $A \cap \varnothing$ is equal to :
(i) A (ii) $\varnothing$
(iii) $A \cup \varnothing$ (iv) $A - \varnothing$

34. A^1 is Equal to :
(i) E (ii) E - A
(iii) A – E (iv) A

35. Number of proper subsets of a given set containing n elements is :
(i) 2^n (ii) $2^n - 1$
(iii) 2^{n-1} (iv) n^2

36. Number of possible subsets of a finite set containing n elements is :
(i) 2^n (ii) $2^n - 1$
(iii) 2^{n-1} (iv) n^2

37. If $A = \{a, b\}$ then the power set of A is
(i) {(a), (b)}
(ii) {(a), (b), (∅)}
(iii) {(a), (b), (∅),(ab)}
(iv) {(a), (ab)}

38. If $A = \{1, 2, 5\}$ $B = \{0, 1, 2, 6, 7\}$ then $A \cap B$ is equal to :
(i) {0, 1, 2}
(ii) {0, 1, 2, 5, 6, 7}
(iii) {1, 2}
(iv) {1, 2, 5, 6, 7}

39. $A \Delta B$ is equal to :
(i) A – B
(ii) B – A
(iii) $A \cup B$
(iv) $(A \cup B) - (A \cap B)$

40. If $(A \cap B) = \varnothing$ then:
(i) $A \subseteq B$
(ii) A = B
(iii) $B \subseteq A$
(iv) A & B are disjoint sets

41. If $A \cap B = A$ then
(i) $A \subseteq B$
(ii) $B \subseteq A$
(iii) $A = \varnothing$
(iv) A and B are disjoint sets.

42. Number of subsets a set of 5 elements can have is :
(i) 25 (ii) 32
(iii) 31 (iv) 20

43. If $A \subset B$ and $B \not\subset A$ then A is called:
(i) Proper subset of B
(ii) Subset of B
(iii) Complement of B
(iv) Universal set of B

44. A set containing limited number of elements is a :
(i) Null set (ii) Finite Set
(iii) Infinite set (iv) Power set

45. If $A = \{6,7, 8, 9\}$ $B = \{6,7, 10\}$ then $A \Delta B$ is :
(i) {6, 7} (ii) {6,7,8,9,10}
(iii) (8, 9, 10} (iv) {8, 9}

46. If A = {p, q, r, s} B = {x, y, z}, then A and B are

(i) Overlapping sets

(ii) Disjoint sets

(iii) Proper subsets

(iv) Subsets

47. Collection or family of all subsets of a set is called:

(i) Universal Set

(ii) Power Set

(iii) Complementary Set

(iv) Superset

48. A set which contains all the elements of sets under consideration is known as:

(i) Power set

(ii) Superset

(iii) Universal Set

(iv) Infinite Set

49. If n (A) = n(B) then A and B are :

(i) Equal sets

(ii) Equivalent sets

(iii) Complementary sets

(iv) Subsets

50. If $A \subseteq \varnothing = \varnothing$, then A is a

(i) Single-ton set

(ii) Infinite set

(iii) Super set

(iv) Null set

Function

51. If $f(x) = 2x^2 + 3$ then f(3) is equal to :

(i) 18 (ii) 21

(iii) 9 (iv) 27

52. f(x) = C is a :

(i) Linear function

(ii) Cubic function

(iii) Constant function

(iv) One-One function

53. $f(x) = x^2 + 5x + 3$ is a

(i) Exponential function

(ii) Irrational function

(iii) Logarithmic function

(iv) Quadratic function

54. If f (-x) = f(x) for all values of x then x is a :

(i) Even function

(ii) Odd function

(iii) Identity function

(iv) Constant function

55. If f = {(1,1) (2, 7) (3, 17) (4, 3)} then the domain of f is

(i) (1, 3, 4, 5)

(ii) (1, 7, 17, 3)

(iii) (1, 2, 3, 4, 5, 6)

(iv) (1, 2, 3, 4)

56. If f(x) = 4 x + 8 then f^{-1} is

(i) $\frac{y+8}{4}$ (ii) $\frac{y-8}{4}$

(iii) $\frac{8x-y}{4}$ (iv) $\frac{y+4}{8}$

57. $f(x) = 2^x$ is an :

(i) Implicit function

(ii) Explicit function

(iii) Even function

(iv) Exponential function

58. If f = {(a, b) (c, d) (e, f) (g, h)} then the range of the function is :

(i) (a, c, e, g)

(ii) (b, d, f, g)

(iii) (a, b, c, d, e)

(iv) (a, b, c, d, e, f, g, h)

59. A function is said to be odd if f(-x) is equal to :

(i) -x (ii) x

(iii) -2x (iv) - f(x)

60. $f(x) = \frac{3}{x-3}$ is undefined when the value of x is equal to :

(i) 1 (ii) 2

(iii) 3 (iv) 0

61. $y = x^2$ is a

(i) Rational function

(ii) Constant function

(iii) Irrational function

(iv) Exponential function

62. If f = {(1, 2) (3, 5) (4, 1)} and g = {(2, 3) (5, 1)(1, 3)} then got is .

(i) {(1, 2)(2,3)(3,5)}

(ii) {(1,3)(3,1)(4,3)}

(iii) {(2,3)(5,1)(1,3)}

(iv) {(3,5)(2,1)(2,3)}

63. A function in which some elements of co-domain are not part of the range is a :

(i) Onto Function

(ii) Into Function

(iii) Constant function

(iv) Linear function

64. A function in which all the elements of co-domains are part of the range is a :

(i) Onto function

(ii) Into function

(iii) Implicity function

(iv) Ever function

65. If A = (1,2,3) , B = {4,5} f $A \to B$ = (1, 4) (2, 4) (3,5) then f $A \to B$ is a :

(i) One one into function

(ii) One one onto function

(iii) Many one into function

(iv) Many one onto function

UNIT-II

Limit and Continuity

66. $\lim_{x \to a} \frac{x^n - a^n}{x - a}$ is equal to:

(i) an^{-1} (ii) na^n

(iii) na^{n-1} (iv) an

67. $Lim_{x \to 3}\left(x^2 + 3\right)$ is equal to

(i) 9 (ii) 12

(iii) 15 (iv) 3

68. $Lim_{x \to 5} \frac{x^2 - 25}{x - 5}$ is equal to

(i) 5 (ii) 10

(iii) 15 (iv) 20

69. $\underset{x\to 0}{Lim}(1+x)^{\frac{1}{x}}$ is equal to

(i) 0 (ii) 1

(iii) ∞ (iv) e

70. $\underset{x\to a}{Lim}\dfrac{x^3-a^3}{x-a}$ is equal to :

(i) a (ii) $3a^2$

(iii) $3x$ (iv) a^3

71. $\underset{x\to 2}{Lim}\dfrac{x^3+8}{x+2}$ is equal to :

(i) 16 (ii) 12

(iii) 4 (iv) -4

72. x fends to zero from the left means :

(i) x is positive and infinitely small

(ii) x is negative and infinitely small

(iii) x is equal to zero

(iv) x is equal to one.

73. $\underset{x\to a}{Lim}.\dfrac{f(x)}{g(x)}$ is equal to :

(i) $\underset{x\to a}{Lim}\, f(x)+\underset{x\to a}{Lim}\, g(x)$

(ii) $\underset{x\to a}{Lim}\, f(x)-\underset{x\to a}{Lim}\, g(x)$

(iii) $\underset{x\to a}{Lim}\, f(x).\underset{x\to a}{Lim}\, g(x)$

(iv) $\dfrac{\underset{x\to a}{Lim}\, f(x)}{\underset{x\to a}{Lim}\, g(x)}$

74. One of the following function which is not continuous.

(i) constant function

(ii) irrational function

(iii) Rational function

(iv) Indentity function

75. $\underset{x\to 0}{\lim}\dfrac{4x}{x}$ is :

(i) 0 (ii) 2

(iii) 3 (iv) 4

76. A function in said to be continuous at $x=a$ it

(i) $\underset{x\to a^-}{Lim}\, f(x)\neq \underset{x\to a^+}{Lim}\, f(x)$

(ii) $\underset{x\to a^-}{Lim}\, f(x) > \underset{x\to a^+}{Lim}\, f(x)$

(iii) $\underset{x\to a^-}{Lim}\, f(x) = f(a)$

(iv) $\underset{x\to a^-}{Lim}\, f(x) = \underset{x\to a^+}{Lim}\, f(x) = f(a)$

77. The limit of a constant is equal to :

(i) One

(ii) Zero

(iii) Equal to that constant

(iv) ∞

78. $\underset{x\to 0}{Lim}\dfrac{e^x-1}{x}$ is equal to

(i) 1 (ii) 0

(iii) e (iv) e^x

79. The sum of two continuous function is a :

(i) Discontinuous function

(ii) Continuous function

(iii) Binomial function

(iv) Even function

80. $\underset{x\to 0}{Lim}\dfrac{a^x-1}{x}$ is equal to

(i) a (ii) $Log\, a$

(iii) $Log_e a$ (iv) 1

Differentiation

81. The differential Co-efficient of a constant 'C' is

(i) 1 (ii) 0

(iii) C (iv) C^2

82. The differential Co-efficient of $4x^3$ w.r.t x is

(i) $4x$ (ii) $4x^2$

(iii) $12x^2$ (iv) $12x^3$

83. $\frac{d}{dx}\left(\frac{1}{x}\right)$ is equal to

(i) x^2 (ii) $\frac{1}{x^2}$

(iii) x (iv) $-x^2$

84. If u and v are two differentiable function of x then $\frac{d}{dx}(u+v)$ is equal to.

(i) $\frac{du}{dx}-\frac{dv}{dx}$ (ii) $\frac{du}{dx}+\frac{dv}{dx}$

(iii) $\frac{du}{dx}\times\frac{dx}{dv}$ (iv) $\frac{dv}{dx}-\frac{du}{dx}$

85. If u and v are two differentiable function of x, then $\frac{d}{dx}(uv)$ is equal to.

(i) $v\frac{d}{dx}u+u\frac{d}{dx}v$

(ii) $v\frac{d}{dx}u-u\frac{d}{dx}v$

(iii) $v\frac{d}{dx}u\times u\frac{d}{dx}v$

(iv) $u\frac{d}{dx}v-v\frac{d}{dx}u$

86. The derivative of $\sqrt{x}$ w.r.t. x is :

(i) $\frac{1}{2}x$ (ii) $\frac{1}{2}\sqrt{x}$

(iii) $\frac{1}{2\sqrt{x}}$ (iv) $\frac{2}{\sqrt{x}}$

87. The 2nd order derivative of x^2 w.r.t x is :

(i) x (ii) 2

(iii) $2x$ (iv) $\frac{1}{2x}$

88. $\frac{d}{dx}10^x$ is equal to :

(i) 10

(ii) 10^x

(iii) $10^x \log 10$

(iv) $10^x Log_e 10$

89. As per chain rule $\frac{dy}{dx}$ is equal to :

(i) $\frac{dy}{du}\times\frac{dx}{du}$ (ii) $\frac{dx}{du}\times\frac{du}{dy}$

(iii) $\frac{dy}{du}\times\frac{du}{dx}$ (iv) $\frac{du}{dx}\times\frac{dx}{dy}$

90. $\frac{d}{dx}(x)^n$ is equal to :

(i) x (ii) nx

(iii) nx^n (iv) nx^{n-1}

91. $\frac{d}{dx}\left(\frac{x^5}{x^8}\right)$ is equal to :

(i) $40\ x$ (ii) $-3x$

(iii) $2x^3$ (iv) $-\frac{3}{x^4}$

92. $\frac{d}{dx}25$ is equal to :

(i) 5 (ii) 2

(iii) 1 (iv) 0

93. The second order derivative of $-x^3$ is :

(i) $-3x$ (ii) $-3x^2$

(iii) $-6x$ (iv) -6

94. $\frac{dy}{dx}\left(5+x^3\right)$ is equal to :

(i) $5+3x^2$ (ii) $3x^3$

(iii) $3x^2$ (iv) $15x^2$

95. $\frac{dy}{dx}\sqrt[3]{x}$ is equal to :

(i) $\frac{1}{3}x$ (ii) $\frac{1}{3}x^2$

(iii) $\frac{1}{3}x^{-\frac{2}{3}}$ (iv) $-x^{\frac{2}{3}}$

Integration

96. The expression $g(x)+c$ which represent all the antiderivative of $f(x)$ is:

(i) Definite integral of $f(x)$

(ii) Indefinite integral of $f(x)$

(iii) Differential Co-efficient of $f(x)$

(iv) Partial differential of $f(x)$

97. $\int x^n dx$ in equal to :

(i) $\frac{x^n}{n}$ (ii) $\frac{x^{n+1}}{n+1}$

(iii) $\frac{x^{n+1}}{n+1}+C$ (iv) $\frac{x^{n-1}}{n-1}$

98. $\int \frac{1}{x^4}dx$ is equal to

(i) $\frac{1}{3x^3}$ (ii) $-\frac{1}{3x^3}$

(iii) $-\frac{1}{4x^3}+C$ (iv) $-\frac{1}{3x^3}+C$

99. $\int \frac{x}{5}dx$ is equal to :

(i) $\frac{1}{10x^2}$ (ii) $\frac{xz}{10}$

(iii) $\frac{x^2}{10}+C$ (iv) C

100. Method of evaluating the integral of product of two function is :

(i) Partial integration

(ii) Integration by parts

(iii) Definite integration

(iv) Indefinite integration

101. Integration is the reverse process of :

(i) Correlation

(ii) Factorisation

(iii) Differentiation

(iv) Indefinite Integration

102. '+C' or constant appears in :

(i) All types of integration

(ii) Definite integration only

(iii) Indefinite integration only

(iv) Differentiation

103. $\int e^x dx$ is equal to :

(i) e^x (ii) e^x+C

(iii) $e^{-x}+C$ (iii) C

104. $\int a^x dx$ is equal to :

(i) a^x+C (ii) $\frac{a^x}{Log_e a}+C$

(iii) a^x (iv) 1

105. $\int e^{5x}\,dx$ is equal to :

(i) e^{5x} (ii) $e^{5x}+C$

(iii) $\frac{e^{5x}}{5}+C$ (iv) $5e^{x}+C$

106. $\int 5^{x}\,dx$ is equal to :

(i) $\frac{5^{x}}{Log_{e}5}$ (ii) $\frac{5^{x}}{Log_{e}5}+C$

(iii) $\frac{Log_{e}^{5}}{5^{x}}$ (iv) $5e^{x}+C$

107. The difference between values of integral of a functions two assigned values of independent violable is :

(i) Definite integral

(ii) Indefinite integral

(iii) Partial derivative

(iv) Integration by part

108. The integral of derivatives of a function is :

(i) The function itself

(ii) A new function

(iii) The differential

(iv) The differential Co-efficient

109. If $\int F(x)\,dx = f(x)$ then $F(x)$ is called :

(i) Integration

(ii) Integral

(iii) Integrand

(iv) Differential

110. If integrals of two functions are equal then the functions are :

(i) Different (ii) Equal

(iii) Even (iv) Odd

Unit- III

Measured of Central Tendency.

111. Sum of deviations taken from A.M. is equal to :

(i) 1 (ii) -1

(iii) zero (iv) 10

112. The sum of the square of the deviations of the values of the variable from A.M is :

(i) Zero (ii) Minimum

(iii) Highest (iv) Maximum

113. The A.M of 1st 10 natural number is :

(i) 4 (ii) 5

(iii) 5.5 (iv) 6

114. The algebraic sum of deviations of 5 numbers taken from 10 is 30 then their A.M is :

(i) 10 (ii) 15

(iii) 16 (iv) 20

115. The A.M of 5,10,25 and x is 12 then the value of x is :

(i) 5 (ii) 8

(iii) 10 (iv) 15

116. In a group there are 15 boys and 10 girls. Their average age is 12. If the average age of girls are 10, the average age of boys is :

(i) 11 (ii) 13.33

(iii) 13 (iv) 8

117. If 1,2,3,4 occurs with frequencies 4,3,2,1 respectively then their A.M is :

(i) 2 (ii) 3

(iii) 4 (iv) 5

118. If two groups of 50 and 100 observations have means of 4 and 7, then their combined mean is :

(i) 4 (ii) 5

(iii) 6 (iv) 6.5

119. One of the following which is not a measure of central tendency :

(i) Mean

(ii) Mean Deviation

(iii) Median

(iv) Mode

120. The measure of central value, that is not affected by presence of extreme values:

(i) H.M

(ii) G.M

(iii) Arithmetic Mean

(iv) Median

Geometric Mean

121. Geometric mean of two numbers is 8, if one in 4 the other number is :

(i) 4 (ii) 8

(iii) 12 (iv) 16

122. If A.M. of two numbers is 27 and H.M. is 3 then G-M is

(i) 9 (ii) 10

(iii) 15 (iv) 81

123. If any value in a series is zero, then the G.M. of the series is :

(i) 1 (ii) -1

(iii) 0 (iv) ∞

124. The G.M. of two numbers is equal to

(i) A.M. X H.M.

(ii) AM - H.M.

(iii) H.M. - A.M.

(iv) $\sqrt{\text{A.M.} \times \text{H.M.}}$

125. The G.M. of two numbers is 15 and one is 5 then the other is

(i) 3 (ii) 45

(iii) 225 (iv) 15

126. G.M. of 2,4,8 is equal to

(i) 5.3 (ii) 16

(iii) 4 (iv) 8

127. The nth root of the product of n observation is known as :

(i) H.M.

(ii) G.M.

(iii) A.M.

(iv) Progressive Avg.

128. The formula used for calculation of G.M. in a discret series is

(i) $n\sqrt{x_1, x_2, x_3,}$

(ii) Antilog $\frac{\sum f \log^x}{N}$

(iii) $\frac{\sum f \log^x}{N}$

(iv) $\frac{\sum f \log^x}{N}$

129. G.M. of 4 numbers is 5, then their product is :

(i) 25 (ii) 125

(iii) 250 (iv) 625

130. Most suitable average for calculation of population growth rate is :
(i) A.M. (ii) G.M.
(iii) H.M. (iv) Median

Harmonic Mean

131. H.M. gives greater weightage to :
(i) Larger items
(ii) Smaller items
(iii) Middle items
(iv) Last items

132. When all the values in a series are equal then the relationship between their A.M. G.M. and H.M. is
(i) A.M. = G.M. = H.M.
(ii) AM $\geq$ G.M. $\geq$ H.M.
(iii) AM < GM < HM
(iii) G.M. >H.N. > A.M.

133. When all the values in a series are different the relationship between A.M. G.M. and H.M. is
(i) A.M. = G.M. = H.M.
(ii) A.M. 7/ G.M. 7/ H.M.
(iii) AM $\angle$ G.M. $\angle$ H.M.
(iv) G.M. 7 H.M. 7 A.M.

134. Harmonic mean of 5,10 and 30 is :
(i) 15 (ii) 9
(iii) 10 (iv) 12

135. The raciprocal of a number is equal to :
(i) Square root of the number
(ii) Square of the number
(iii) One divided by that number
(iv) Cube of that number

Median

136. Median is a :
(i) Mathematical average
(ii) Positional average
(iii) Moving average
(iv) Progressive average

137. Median of 12,10,15,18 and 14 is :
(i) 10 (ii) 12
(iii) 14 (iv) 15

138. Median is :
(i) The most frequent value
(ii) The middle most value
(iii) The highest value
(iv) The smallest value

139. Median divides a series into :
(i) Ten parts
(ii) 8 parts
(iii) Four parts
(iv) Two parts

140. A cumulative frequency curve is known as :
(i) Pictogram
(ii) Bar diagram
(iii) Ogive
(iv) Lorenjo Curve

141. One of the following which can be found out by using graphical method.
(i) A.M. (ii) G.M.
(iii) H.M. (iv) Median

142. Sum of deviations of the values of the variable ignoring + and - signs from median is :
(i) Highest (ii) Lowest
(iii) Zero (iv) Maximum

143. Median is equal to :

(i) First Quartile

(ii) Second Quartile

(iii) Fourth Decile

(iv) 3rd Quartile

144. Median is more suitable for :

(i) Inclusive classes

(ii) Open ended data

(iii) Exclusive classes

(iv) Close ended data

145. Value of Median in case of Individual series with even number of observations is the size of :

(i) $^{N}/_{2th}$ item

(ii) $\frac{N+1}{2}$th item

(iii) $\frac{N}{4}$th item

(iv) $\frac{N+1}{4}$th item

146. Quartile divides a distribution into :

(i) Two equal parts

(ii) Three equal parts

(iii) Four equal parts

(iv) Eight equal parts

147. The number of Quartiles in a distribution are

(i) One (ii) Two

(iii) Three (iv) Four

148. In a symmetric distribution quartiles are equidistant from :

(i) Mean (ii) Median

(iii) Made (iv) G.M.

149. The 1st Quartile lies at :

(i) The middle of the observation

(ii) At the end of the observation

(iii) At the middle of 1st 50% of the observation

(iv) At the middle of 2nd 50% of the observation

150. Position of Q_3 is same as that of :

(i) D_{10} (ii) D_5

(iii) P_{25} (iv) P_{75}

Mode

151. The most frequently occurring value in a distribution is :

(i) Mean (ii) Median

(iii) H.M. (iv) Mode

152. A series having two modes is a

(i) Multimodel series

(ii) Bimodal series

(iii) Trimodal series

(iv) Unimodal series

153. A series having more than two modes is a :

(i) Trimodal series

(ii) Uni-modal series

(iii) Multimodal series

(iv) Complex series

154. In a moderately assymmetric distribution mode in equal to

(i) 3 $\bar{X}$ -2 Med

(ii) 2 Med - 3 $\bar{X}$

(iii) 3 Med - 2 $\bar{X}$

(iv) 3 M - 3 $\bar{X}$

155. The mode of the series 5, 9, 7, 7, 5, 9, 6, 7, 5, 4, 1, 5 is

(i) 4 (ii) 5

(iii) 7 (iv) 9

156. Mode can be graphically located by the help of :

(i) Frequency curve

(ii) Ogive

(iii) Bar diagram

(iv) Histogram

157. Like median mode is a :

(i) Mathematical measure

(ii) Positional measure

(iii) Relative measure

(iv) Derived measure

Unit-IV

158. An absolute measure of dispersion is expressed in terms of :

(i) Ratio (ii) Percentage

(iii) Co-efficient (iv) Data unit

159. The difference between largest value and smallest value in a series is :

(i) Quartile

(ii) Range

(iii) Co-efficient of range

(iv) Mean Deviation

160. Range is a/an

(i) Algebric measure

(ii) Graphic measure

(iii) Positional measure

(iv) Relative measure

161. One among the following that is not a positional measure of dispersion is :

(i) Range

(ii) Quartile deviation

(iii) Mean Deviation

(iv) Inter Quartile range

162. If

X	0-10	10-20	20-30	30-40	40-50
f	3	5	15	10	4

The range is :

(i) 12 (ii) 40

(iii) 50 (iv) 1

163. If the largest and smallest value in a distribution are respectively 0 and 50, then the co-efficient of range is :

(i) 0 (ii) 1

(iii) 50 (iv) 49

164. The difference between Q_3 and Q_1 is called.

(i) Quartile Deviation

(ii) Range

(iii) Semi Inter quartile range

(iv) Inter quartile range

165. If Q_3 and Q1 are respectively 40 and 20, the quartile deviation is :

(i) 20

(ii) 0.5

(iii) 60

(iv) 10

166. Semi - inter quartile range is also known as :

(i) Inter quartile range

(ii) Quartile deviation

(iii) Co-efficient of quartile deviation

(iv) Quartile range

167. Co-efficient of Quartile deviation is:

(i) $\frac{Q_3 + Q_1}{Q_3 - Q_1}$ (ii) $\frac{Q_3 - Q_1}{Q_3 + Q_1}$

(iii) $\frac{Q_3 + Q_1}{2}$ (iv) $\frac{Q_3 - Q_1}{2}$

168. Co-efficient of range is :

(i) $\frac{L + S}{L - S}$ (ii) $\frac{L - S}{L + S}$

(iii) $\frac{L + S}{2}$ (iv) $\frac{L - S}{2}$

169. Dispersion is a measure of :

(i) Symmetry

(ii) Variation

(iii) Asymmetry

(iv) Co-relation

170. Quartile deviation in equal to :

(i) $\frac{Q_3 + Q_1}{2}$ (ii) $\frac{Q_3 + Q_1}{Q_3 - Q_1}$

(iii) $\frac{Q_3 - Q_1}{Q_3 + Q_1}$ (iv) $\frac{Q_3 - Q_1}{2}$

171. One of the following measure that is not affected by extreme values.

(i) Range (ii) M.D.

(iii) S.D. (iv) Q.D.

172. Measure of dispersion that is based on middle 50% of the items is :

(i) Range (ii) Q.D

(iii) M.D. (iv) S.D.

173. For observations 6, 4, 1, 6, 5, 10, 4, 8 range is :

(i) 10 (ii) 9

(iii) 8 (iv) 7

Mean Deviation

174. The other name of mean deviation is :

(i) Variance

(ii) Average deviation

(iii) Root mean square deviation

(iv) Quartile deviation

175. Mean deviation is a :

(i) Graphic measure

(ii) Algebric measure

(iii) Relative measure

(iv) Positional measure

176. The co-efficient of M.D. when deviations are taken from mean is:

(i) $\frac{M.D}{100}$ (ii) $\frac{M.D}{\bar{X}}$

(iii) $\frac{MD}{Med}$ (iv) $\frac{M.D}{Mode}$

177. The most preferred measure of central tendency for calculation of M.D. is

(i) Mean (ii) Median

(iii) Mode (iv) G.M.

178. One of the following which is based on all the values of the series is :

(i) Range

(ii) Quartile deviation

(iii) Co-efficient of range

(iv) Mean deviation

179. The most practical measure of dispersion used for forecasting of business cycle is :

(i) Range (ii) M.D.

(iii) Q.D (iv) S.D.

180. In a symmetric series if the S.D. is 20, the M.D. is :

(i) 5 (ii) 8

(iii) 12 (iv) 16

Standard Deviation

181. The concept of S.D. was developed by :

(i) Karlpearson

(ii) Coxton and Cowden

(iii) Bowly

(iv) Clark

182. In a symmetric distribution the relationship among Q.D., M.D. and S.D. is :

(i) S.D. < M.D < Q.D.

(ii) Q.D < M.D < S.D.

(iii) S.D. = M.D. = Q.D.

(iv) M.D. < Q.D. < S.D.

183. S.D. is also known as :

(i) Avg. Deviation

(ii) Variance

(iii) Root mean square deviation

(iv) Co-efficient of variation

184. The relationship between S.D. and M.D. in a symmetric series is :

(i) 2SD = 3MD

(ii) 5SD = 6MD

(iii) 4SD = 5MD

(iv) MD = SD

185. If each observation in a series is divided by 5 the S.D. of new observations is :

(i) $^1/_{10th}$ of the S.D. of original observations.

(ii) 5 times of S.D. of original observations.

(iii) Remains unchanged.

(iv) $^1/_5$th of the S.D. of original observations.

186. One of the following that is a unitless measure of dispersion.

(i) S.D.

(ii) M.D.

(iii) Range

(iv) Co-efficient of variation

187. If the mean and S.D. of series A and B are, $\overline{X_A}$ =15, σ_A 5, $\overline{X_B}$ = 20, σ_B = 4, the more consistent between the two is :

(i) Series A

(ii) Series B

(iii) A and B series are equally consistent

(iv) Both are inconsistent.

188. Standard deviation of the natural number 1 to 10 is :

(i) 2 (ii) 2.5

(iii) 2.87 (iv) 4

189. Variance of a distribution is equal to :

(i) $\frac{\sigma}{\bar{X}}$ (ii) $\frac{\sigma}{\bar{X}}$ X 100

(iii) σ^2 (iv) $\frac{\bar{X}}{\sigma}$

190. The Co-efficient of variation of a distribution is equal to :

(i) $\frac{\sigma}{\bar{X}}$

(ii) $\frac{\sigma}{\bar{X}}$ X 100

(iii) σ^2

(iv) $\frac{\bar{X}}{\sigma}$

191. If S.D. of a series is 15 its variance is :

(i) $\frac{15}{100}$ (ii) $\sqrt{15}$

(iii) 225 (iv) 15%

192. If each observation of a series is added with 10, then the S.D. of the new observations is :

(i) Added by 10

(ii) Reduced by 10

(iii) Multiplied by 10

(v) Remains unchanged

193. Measure of dispersion, used for statistical analysis like skewness, correlation regression etc., is :

(i) Range (ii) Q.D.

(iii) M.D. (iv) S.D.

194. In a symmetrical distribution $\bar{X} \pm 3\sigma$ covers.

(i) 68.27% of total items

(ii) 95.45% of total items

(iii) 99.73% of total items

(iv) 99.45% of total items

195. In a symmetric series range is equal to

(i) 4 S.D.

(ii) 5 S.D.

(iii) 6 S.D.

(iv) 7 S.D.

196. In absence of any special reason the measure of dispersion that is considered the best is :

(i) Range

(ii) Q.D.

(iii) M.D.

(iv) S.D.

Answer Keys

1. (ii) Scalar Matrix
2. (iv) Square Matrix
3. (ii) Null Matrix
4. (i) Singular Matrix
5. (iii) Sub Matrix
6. (ii) Equal Matrices
7. (ii) Non -Singular Matrix
8. (ii) Multiplication Proper
9. (ii) Equivalent matrices
10. (ii) 38
11. (ii) 3 X 2
12. (ii) Unit Matrix
13. (ii) $\begin{pmatrix} 7 & 9 \\ 11 & 3 \end{pmatrix}$
14. (iii) Transpose Matrix
15. (iii) $A = A^{-1}$
16. (ii) $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$
17. (ii) Symmetric matrix
18. (ii) 1,2, 4, 5
19. (iv) Zero matrix
20. (iii) The col. number of the first must be equal to the row number of the 2nd matrix.
21. (iii) $\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{33} \end{vmatrix}$
22. (iv) a_{22}
24. (ii) 1
25. (iii) remain same but with opposite sign
26. (ii) Remain unchanged
27. (ii) $\begin{vmatrix} 4 & 5 \\ 6 & 6 \end{vmatrix}$
28. (iii) O
29. (iv) 12
30. (ii) $(-1)^2$ MII
31. (iii) Equal sets
32. (ii) Null Sets
33. (ii) φ
34. (ii) E-A
35. (ii) 2^n-1
36. (i) 2^n
37. (iii) {(a) (b) φ(a,b)}
38. (ii) {1,2}
39. (iv) (AUB) - (A$\cap$B)
40. (iv) A & B are disjoint sets
41. (ii) B $\subseteq$ A
42, (ii) 32
43. (i) Proper subset of B
44. (ii) Finite set
45. (iii) {8, 9, 10}
46. (ii) Disjoint sets
47. (ii) Power Set
48. (ii) Universal set
49. (ii) Equivalent sets

50. (iv) Null set

51. (ii) 21

52. (iii) Constant function

53. (iv) Quadratic function

54. (i) Even function

55. (iv) (1,2, 3, 4)

56. (ii) $\frac{y-8}{4}$

57. (iv) Exponential function

58. (ii) (b, d, f, g)

59. (iv) - f(x)

60. (iii) 3

61. (iii) Irrational function

62. (ii) {(1, 3) (3, 1) (4, 3)}

64. (i) Onto function

65. (iv) Many one onto

66. (ii) na^{n-1}

67. (ii) 12

68. (ii) 10

69. (iv) e

70. (ii) $3a^2$

71. (iii) 4

72. (ii) x is positive and i infinitely small

73. (iv) $\frac{\lim\limits_{x\to a} f(x)}{\lim\limits_{x\to a} g(x)}$

74. (ii) Irrational function

75. (iv) 4

76. (iv) $\lim\limits_{x\to a^-} f(x) = \lim\limits_{x\to a^+} f(x) = f(a)$

77. (ii) Equal to the constant.

78. (i) 1

79. (ii) Continuous Function

80. (iii) Log_e^a

81. (ii) O

82. (iii) $12x^2$

83. (ii) $\frac{1}{x^2}$

84. (iii) $\frac{du}{dx}+\frac{dv}{dx}$

86. (iii) $\frac{1}{2\sqrt{x}}$

87. (iii) 2

88. (iv) $10^x \text{Log}_e 10$

89. (iii) $\frac{dy}{du} x \frac{du}{dx}$

90. (iv) $n^{x^{n-1}}$

91. (iv) $-\frac{3}{x^4}$

92. (iv) O

93. (ii) - 6x

94. (iii) $3x^2$

95. (iii) $\frac{1}{3} x \frac{-2}{3}$

96. (iii) Indefinite integration of f(x)

97. (iii) $\frac{x^{n+1}}{n+1}$

98. (iv) $-\frac{1}{3x^3}+C$

99. (iii) $-\frac{x^2}{10}+C$

100. (iii) Integration by parts.

101. (i) Differentiation

102. (ii) Indefinite integration

103. (iii) $e^x + c$

104. (ii) $\frac{a^x}{\text{Log}_e a}$

105. (iii) $\frac{e^{5x}}{5}+C$

106. (iii) $\frac{5^x}{\text{Log}_e 5}+C$

107. (i) Definite integral

108. (i) Function itself

109. (iii) Integrand

110. (ii) Equal

111. (iii) Zero

112. (iii) Minimum

113. (iii) 5.5

114. (iii) 16

115. (ii) 18

116. (ii) 13.33

117. (i) 2

118. (iii) 6

119. (iii) Mean Deviation

120. (iv) Median

121. (iv) 16

122. (i) 9

123. (iii) 0

124. (iv) $\sqrt{\text{A.M} \times \text{H.M.}}$

125. (ii) 45

126. (iii) 4

127. (ii) G.M.

128. (II) A.L. $\frac{\Sigma f \text{Log} k}{N}$

129. (iv) 625

130. (ii) G.M.

131. (ii) Smallest items.

132. (i) A.M. = GM = HM

133. (ii) AM > GM > HM

134. (ii) 9

135. (iii) One divided by the number

136. (ii) Positional average

137. (ii) 12

138. (ii) Middle most value

139. (iv) Two parts

140. (iii) Ogive

141. (iv) Median

142. (ii) Lowest

143. (iii) Second Quantile

144. (iii) Open ended data

145. (ii) $\frac{N+1}{2}$th items

146. (iii) Four equal parts

147. (iii) Three

148. (ii) Median

149. (iii) Middle of 1st 50%

150. (iv) P_{75}

151. (iv) Mode

152. (ii) Bimodal series

153. (iii) Multimodal

154. (iii) 3 Med - 2 Mean

155. (ii) 5

156. (iv) Histogram

157. (ii) Positional avg.

158. (iv) Data unit

159. (ii) Range

160. (iii) Positional measure

161. (iii) Mean Deviation

162. (iii) 50

163. (ii) 1

164. (iv) Inter quartile Range

165. (iv) 10

166. (ii) Quartile Deviation

167. (ii) $\frac{Q_3 - Q_1}{Q_3 + Q_1}$

168. (ii) $\frac{L - S}{L + S}$

169. (iii) Variation

170. (iv) $\frac{Q_3 - Q_1}{2}$

171. (iv) Q.D.

172. (ii) Q.D.

173. (ii) 9

174. (ii) Avg. Deviation

175. (ii) Algebric measure

176. (ii) $\frac{M.D}{\bar{x}}$

177. (ii) Median

178. (iv) Mean Deviation

179. (ii) M.D.

180. (iv) 16

181. (i) Kurl pearson

182. (ii) QD∠MD∠SD

183. (iii) Root means square deviation

184. (iii) 4SD = 5MD

185. (IV) $^1/_{5th}$ of S.D. of Original observation.

186. (iv) Co-efficient of variation.

187. (ii) Series B

188. (iii) 2.87

189. (iii) σ^2

190. (ii) $\frac{\sigma}{\bar{x}} \times 100$

191. (iii) 225

192. (iv) Remains unchanged

193. (iv) S.D.

194. (iii) 99.73%

195. (iv) 6SD

196. (iv) SD

II. Fill in the blanks.

Unit-I

Matrix

1. If $A = A^t$ then A is a _____ matrix
2. When one matrix is multiplied by another matrix it is called multiplication _____.
3. Matrix multiplication is _____ in nature.
4. If A and B are two matrices then AB and BA are not _____
5. If all the elements of a matrix are equal to corresponding elements of another matrix then they are _____ matrices.
6. If $A \times A^t = I$, then A in an _____ matrix.
7. The transpose of the matrix $\begin{pmatrix} -3 & 4 \\ 1 & 2 \end{pmatrix}$ is _____.
8. A square matrix whose determinant is zero a _____ matrix.
9. Two matrices are compatible for addition if they are of _____ order.
10. The matrix associated with a determinant is a _____ matrix.
11. $\begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} + \begin{pmatrix} -2 & 2 \\ 3 & -4 \end{pmatrix} =$ _____
12. $5\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix} =$ _____
13. The _____ of a non singular matrix is equal to $\frac{\text{Adjoint } A}{|A|}$
14. If $A = \begin{pmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \end{pmatrix}$ the 5A = _____
15. If A, B and C are three matrices then (AB) C = _____

Determinant

16. A determinant of 3rd order contain _____ number of elements fat.
17. _____ rule is applied to solve a system of equation by using determinant.
18. Sarrus diagram can be applied to a determinant of _____ order only.
19. A determinant always possess _____ number of elements.
20. The value of a determinant becomes zero if any two rows / columns of the determinant are _____.
21. Crammer Rule can be applied only if the value of the determinant is not _____.
22. In a second order determinant there are only _____ number of elements.
23. The number of rows and columns of a determinant are always _____.

24. If two adjacent rows / columns of a determinant are inter changed the value of the determinant remains _____.

25. Cofactor of an element in a determinant in its _____ multiplied by.$(-1)^{i+j}$

Set Theory

26. Two sets having no common elements are _____sets.

27. A set having 5 elements has _____ number of proper subsets.

28. Sets having same number of elements are _____ sets.

29. Set having only one element is a _____ set.

30. Sets having at least one element in common are known as _____ sets.

31. Set of natural numbers less than one is a _____ set.

32. A _____ set is subset of every set

33. According to commutative law AUB is equal to _____

34. According to Demorgan''s law (AUB) = _____

35. The pictorial representation of set is named after English logician _____

36. Number of possible subsets of a finite set having n element in _____

37. Number of possible proper subsets of a finite set having n number elements is _____

38. If A is a subset of B then B is called _____ set of A

39. The empty set is a proper subset of every set except _____.

40. A Δ B = (AUB) - _____

Function

41. F(x) = x is an _____ function

42. A function F $x \rightarrow$y in called _____ function if more than one element in x have the same image in y.

43. If y = f (x), y as the _____ variable

44. If f : A$\rightarrow$B then set A is called _____ of the function

45. If y = f(x) x is the _____ variable (Independent)

46. If f(x) = 2x, f^{-1} = _____

47. Images refer to the values of _____.

48. Range is a _____ of co-domain

49. If f (-x) = f(x), then f(x) is a/an _____ function.

50. The set of independent variable in a function is called _____.

51. y = f/g (x)} is a _____ function.

52. One to one function is also known as _____ function.

53. Y = e^x is a _____ function.

54. Absolute value function is also known as _____ function.

55. Function of a function is known as _____ function.

Unit -II

Limit

56. The sum of two continuous function is _____ at the point x = a.

57. To be continuous Lim *f(x)* Lim *f(x)* and _____ must have finite x^{-a} and definite values.

x - a^- $x \to a^+$

58. $x \to$ a from the left indicates x is _____.

59. $x \to$ a from the right indicates x is _____

60. If two limits are not equal then _____ of the function does and exists.

61. The product of two continuous function is a _____ function.

62. Calculus is based on the theory of _____

63. $\lim_{x \to a} \frac{x^n - a^n}{x - a}$ = _____

64. Lim $3x^2 + 4x + 5$ = _____

$x \to 1$

65. $\frac{f(x)}{g(x)}$ is continuous at the point x = a provided g (x)$\neq$ _____

Differentiation

66. The derivative of the sum of two differentiable functions is the _____ of their derivative.

67. $\frac{d}{de}$ u.v. = v $\frac{d}{dx}$ u + _____

68. The derivative of a constant is always equal to _____

69. The second order derivative of x^3 is _____

70. The rule that is applied to differentiate a composite function is known as _____ rule.

71. The second order derivation is denoted by _____

72. $\frac{d}{dx}\left(\frac{1}{x_v}\right)$ = _____

73. The process of differentiation and integration are _____ to each other.

74. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{\_\_\_\_\_}$

75. Differentiation of a constant with any function is equal to _____ x $\frac{d}{dx}$ f(x).

Integration

76. Integration is also known as _____ derivative.

77. $\int \frac{1}{x}\, dx = Log\ x + $ _____

78. Integration of the derivatives of a function is the _____ itself.

79. The presence of +C in the result of integration denotes _____ integrals.

80. The integration of the sum of two function is _____ to the sum of their integrals.

81. $\int$ _____ $dx = \frac{x^{n+1}}{n+1} + C$

82. $\int$ _____ $dx = \frac{x^5}{5} + C$

83. $\int x^{-1}\, dx =$ _____ $+ C$

84. The expression $\int (x)\, dx$ is read as _____ $f(x)$ with respect to x.

85, $\int \sqrt{x}\, dx =$ _____ $+ C$

Unit - III

Mean

86. The sum of square of deviations of the values of the variable from their A.M. is _____.

87. The mean of 8 values is 15. A new value 24 is added to it. The A.M. of all nine values is _____

88. If 10 is subtracted from each values of a series then the A.M. of the series is reduced by _____.

89. If each value of a set a values is divided by 10 then, the A.M. of the new observations is _____ of the A.M. of the original observations.

90. Arithmetic mean is affected by presence of _____ values.

91. Weighted A.M. gives ____ importance to different values in the series.

92. _____ values are taken into consideration for calculation of A.M.

93. A.M. gives _____ weightage to all the values.

94. $\frac{N_1\overline{X_1} + N_2\overline{X_2}}{N_1 + N_2}$ = _____

95. If the mean of 5,6,7 and x in 5 then the value of x is _____.

Geometric Mean

96. G.M. of a series is always _____ than its A.M.

97. G.M. is a _____ measure of central tendency.

98. G.M. of a series is always _____ than its H.M.

99. Geometric mean of 9, 27, 3 is _____

100. G.M. is less affected by extreme values in comparison to _____

Harmonic Mean

101. H.M. give _____ importance to lesser values.
102. H.M. can not be computed when any of the values in series is _____
103. The reciprocal of the _____ of the reciprocals of the values of a distribution is the harmonic mean.
104. The H.M. of 20 and 30 is equal to _____
105. For any two positive number A.M. X H.M. = _____

Median

106. Anogive is a _____ frequency curve.
107. Median divides a series into _____ equal parts.
108. Median is a more suitable average for grouped data with _____ classes.
109. Median is represented by _____ quartile.
110. Deciles divide the series into _____ equal parts.
111. Median is a _____ average
112. The Median of 20, 18, 22, 16 is _____.
113. Quartiles, Deciles and percentiles are known as _____ values.

Mode

114. The value at the point around which the items tends to be most heavily concentrated is _____.
115. A series having a unique modal value is a _____ series.
116. Mode can be determined graphically by the use of _____.
117. Mode + 2 $\overline{X}$ = _____
118. Grouping and analysis technique is used to find out _____.
119. In a moderately asymmetric distribution if the value of mean, median and are 15 and 12, the value of mode is _____.
120. In a symmetric distribution the mean, median and mode are _____.

Unit - IV

121. The difference between highest and lowest values in a series is known as _____. (Range)
122. Semi inter quartile range is also known as quartile _____.
123. Measure dispersions are known as average of _____ order.
124. _____ is the simplest measure of dispersion.

125. If the range of a series is 50 and the lowest value is 7, then the highest value is _____.

126. The value of range is expressed in terms of _____.

127. Range is a _____ measure of dispersion.

128. A measure of dispersion expressed in terms co-efficient is a _____ measure.

129. A measure of dispersion expressed in terms of data unit is a ____ measure.

130. The difference between Q_3 and Q_1 is known as inter quartile _____.

131. If in a distribution Q_3 is 40 and quartile deviation is 5.5, the Q_1 is ___.

Mean Deviation

132. Mean deviation is also known as _____ deviation.

133. Co-efficient of M.D. from median is equal to _____.

134. M.D. of a series from median is _____ than M.D. from mean.

135. _____ is considered most suitable average for calculation of M.D.

136. In a symmetric distribution the ratio of Q.D. M.D. and S.D. is 10 : _____ : 15.

Standard Deviation

137. Standard deviation is _____ to change in origin.

138. Standard deviation _____ upon change in scale.

139. Standard deviation is also known as _____ mean square deviation.

140. $\bar{X} + 3\sigma$ covers _____ % of the total items in the distribution.

141. $\bar{X} \pm \sigma$ covers _____ % of the total items in a series.

142. As a measure of dispersion _____ remains unchanged if each observation is increased or decreased by a constant number.

Answer Keys

1. Symmetric
2. Proper
3. Associative
4. Equal
5. Equal
6. Orthogonal
7. $\begin{pmatrix} -3 & 1 \\ 4 & 2 \end{pmatrix}$
8. Singular
9. Same / Equal
10. Square
11. $\begin{pmatrix} 3 & 8 \\ 10 & 4 \end{pmatrix}$
12. $\begin{pmatrix} 10 & 15 \\ 20 & 25 \end{pmatrix}$
13. Inverse
14. $\begin{pmatrix} 10 & 15 & 20 \\ 25 & 30 & 35 \end{pmatrix}$
15. A (B C)
16. 9
17. Crammer
18. 3rd
19. Square
20. Identical / Equal
21. Zero
22. Four
23. Equal
24. Same / Unchange
25. $(-1)^{i+j}$
26. Dispoint
27. 31
28. Equivalent
29. Singleton / Unit
30. Overlapping
31. Null / Empty / void
32. Null / Empty / void
33. BUA
34. $A^1 \cap B^1$
35. John Ven
36. 2^n
37. 2^n-1
38. Super
39. Itself
40. $A \cap B$
41. Identity
42. Many one
43. Dependent
44. Domain
45. Independent

46. $^{Y}/_{z}$
47. Co-domain
48. Subset
49. Even
50. Domain
51. Composite
52. Injective
53. Exponential
54. Modulus
55. Composite
56. Continuous
57. f (a)
58. Negative
59. Positive
60. Limit
61. Continuous
62. Limit
63. na^{n-1}
64. 12
65. O
66. Sum
67. $u\frac{d}{dx}v$
68. zero
69. $6x$
70. chain
71. $\frac{d^2y}{dx^2}$
72. $-4x^{-5}$
73. Reverse / Opposite
74. V^2
75. Constant (c)
76. anti
77. C
78. Function
79. Indefinite
80. Equal
81. X^n
82. X^5
83. Log X
84. Integral
85. $\frac{2}{3}x^{\frac{3}{2}}$
86. Minimum
87. 16
88. 10
89. $^{1}/_{10}$ th
90. Extreme
91. Different
92. All
93. Equal

94. $\overline{x_{12}}$

95. 2

96. $\leq$

97. Mathematical

98. $\geq$

99. 9

100. A.M.

101. More

102. Zero

103. A.M.

104. 24

105. GM^2

106. Cumulative

107. Two

108. Open ended

109. Second

110. Ten

111. Positional

112. 19

113. Partition

114. Mode

115. Uni-modal

116. Histogram

117. 3 Median

118. Mode

119. 6

120. Equal

121. Range

122. Deviation

123. Second

124. Range

125. 57

126. Units

127. Positional

128. Relative

129. Absolute

130. Range

131. 29

132. Average

133. M.D. / Median

134. Less

135. Mean

136. 12

137. Independent

138. Dependent

139. Root

140. 68.27%

141. 99.73

142. S.D.

III. Express the Following in One Word / Term Each.

Matrix

1. Two matrices of equal order are known as :
2. A square matrix the determinant of which is zero is a
3. A matrix obtained by changing rows into columns and columns into rows of a given matrix is known as (Transpose Matrix)
4. A matrix having only one row and any number of column is called. (Row Matrix)
5. A square matrix the determinant of which is not zero is (Non singular matrix)
6. A square matrix which when multiplied by its transpose amounts to an identity matrix is :
7. A square matrix in which all the leading diagonal elements are equal is : (Scalar matrix)
8. An element both the subscripts 'i' and 'j' of which are equal is a :
9. A square matrix in which all the leading diagonal elements are unity and all other elements are zero is a:
10. A matrix that appears with equal number of rows and columns is :

Determinant

11. The minor of a_{ij} multiplied by $(-1)^{i+j}$ in known as its :
12. The horizontal lines in determinant are :
13. The vertical lines in a determinant are :
14. A determinant with 3 cows and 3 columns is a.
15. The method of solving linear equations with the help of determiant is known as :
16. The process of converting rows into columns and columns into rows in a determinant is :
17. Eliminating the rows and columns belonging to a particular elements in a determinant, give its :

Set Theory

18. The collection of all subsets of a set is :
19. A set containing only one element is
20. A set containing definite number of elements is :
21. The method of presenting a set by describing the common characteristics of the elements is :

22. The method of presenting a set by listing all the elements is : (Roster/ Tabular / Enumerative).

23. Pictorial presentation of set in known as :

24. A set containing infinite number of elements :

25. The law which states A UB - BUA is known as :

26. Sets having common elements are:

27. Sets having no common elements are :

28. The number of elements present in a set in known as :

29. A set which contains all the sets under consideration as its subset is termed as :

30. A group of elements having some common property is known as :

Function :

31. One to one function is known as :

32. The set of independent variable in a function is known as :

33. The set of dependent variable in a function is

34. The function of a function is

35. A function in which, the image of an element is the element itself is :

36. A function which is obtained by inter changing the order pairs of a one -one onto function is

37. The other name of absolute value function is :

38. A function that is directly not expressed in terms of the independent variable is :

39. A function which is directly expressed in terms of independent variable is :

40. Increasing and decreasing functions are known as :

Unit -II

Limit

41. A function whose Lim f (x), Lim f (x) and f (a) are definite and equal is a:

$x \to a^-$ $x \to a^+$

42. The limit of f(x) as $x \to a$ from a lower value is :

43. The limit of f(x) as $x \to a$ from a higher value is :

44. A function whose limits do not exist at x = a is a :

45. Method used for finding limit when numerator / denominator of a function consists of square root is :

Differentiation

46. The other name of differential co efficient is :

47. The rule used for differentiation of a composite function is :

48. The limit of the ratio of increment in dependent variable corresponding to a small increment in the independent variable is known as :

49. The process of obtaining derivative of a function by using the definition is :

50. The process of differentiation of a function for more than one independent variable is known as :

Integration

51. The process of integration is otherwise known as :

52. The process of finding the functional relationship between any two or more variables from the rate of change existing between them is :

53. The process of integration of the product of any two function is :

54, The function to be integrated is known as :

Unit - III

Mean

55. A single typical value which is best representative of a group of values is :

56. The number of times a value occurs in a series is :

57. An average that gives different weights to different values is :

58. The unified means of two or more series is :

59. A series that is arranged chronologically is known as :

60. A variable that takes only integral values is :

Geometric Mean

61. Nath root of the product of a n items is :

62. The reverse process of logarithm is:

63. Reciprocal of the A.M. of the sum of reciprocals of a series is.

64. The value obtained by dividing one by the number is the numbers :

65. Reciprocal of the reciprocal of a number is :

Median

66. The value that lies in the middle of a distribution is :

67. Curve representing cummulative frequency is :

68. Statistical measure that divides a series into two equal halves is :

69. Partition value that divides a distribution into 4 equal parts.

70. Quartiles, Deciles and percentiles are known as :

Mode

71. Most frequently occurring value in a series is :

72. A series with two mode is :

73. A series whose mean, median, mode are not equal.

74. A series whose mean, median, mode are not equal :

75. A series with unique modal value is:

76. A series with many modes is :

77. Measures of dispersion are known as :

78. A measure of dispersion expressed in terms of co-efficient is :

79. A measure of dispersion expressed in terms of original data unit is :

80. Statistical measures used to study variation in values of a distribution is :

81. The other name of a symmetric distribution is :

82. The other name of M.D. is

83. Difference between highest and lowest value in a series is : (Range)

Answer Keys

1. Equivalent matrices
2. Singular matrix
3. Transpose matrix
4. Row matrix
5. Non - Singular matrix
6. Orthogonal matrix
7. Scalar matrix
8. Digonal elements
9. Unit / Identity matrix
10. Square matrix
11. Cofactor
12. Rows
13. Columns
14. 3rd order determinant
15. Crammer's Rule
16. Transposing
17. Minor
18. Power Set
19. Single or / unit set
20. Finite set
21. Set builder / Rule method
22. Roster / Tabular
23. Venn Diagram
24. Infinite Set
25. Associative Law
26. Overlapping Set
27. Disjoint Set
28. Cardinal number
29. Universal Set
30. Set
31. Anti differentiation
32. Domain
33. Co-domain
34. Composite function
35. Identity function
36. Inverse function
37. Modulus function
38. Implicit function
39. Explicit function
40. Monotonic function

41. Continuous function
42. Left hand limit
43. Right hand limit
44. Discontinuous function
45. Rationalization Method
46. Derivative
47. Chain Rule
48. Differential Co-efficient
49. Differentiation from 1st Principle
50. Partial differentiation
51. Anti differentiation
52. Integration
53. Integration by parts
54. Integrand
55. Central value
56. Frequency
57. Weighted Average
58. Combined mean
59. Time series
60. Discret variable
61. Geometric mean
62. Anti logarithm
63. Harmonic mean
64. Raciprocal
65. The number itself
66. Median
67. Ogive
68. Median
69. Quartile
70. Portion values
71. Mode
72. Bimodal Series
73. Symmetric Series
74. Assymmetric Series
75. Unimodal series
76. Multimodal Series
77. Second order averages
78. Relative measure
79. Absolute measure
80. Measure of disparsion
81. Normal Distribution
82. Average Deviation
83. Range

IV. Answer the following questions in one sentence each Matrix.

1. What do you mean by equivalent matrices ?
2. What is a sub matrix ?
3. What is an identity matrix ?
4. State the condition required for multiplication of two matrices ?
5. What do you mean by magnitude or order of a matrix ?
6. State the condition required to find out the inverse of a matrix.
7. What is a matrix ?
8. What is a symmetric matrix ?
9. What do you mean by multiplication proper ?
10. What is a square matrix ?

Determinant

11. What do you mean by minor of an element in a determinant ?
12. How co-factor of an element is found out ?
13. If $\begin{vmatrix} x & 4 \\ 2 & 4 \end{vmatrix} = \begin{vmatrix} 5 & 4 \\ 2 & 3 \end{vmatrix}$

    Find the value of x.
14. Express the following as sum of two determinants.

$$\begin{vmatrix} 1+2 & 1 & 5 \\ 3+6 & 3 & 6 \\ 2+4 & 2 & 7 \end{vmatrix}$$

15. Write any one property of determinant.
16. Present the Sarrus Expansion method diagramatically.
17. Evaluate $\begin{vmatrix} 0 & 0 & 5 \\ 5 & 4 & 2 \\ 3 & 8 & 6 \end{vmatrix}$
18. What do you mean by 3rd order determinant ?

    Explain with example.
19. Evaluate $\begin{vmatrix} a & b \\ c & d \end{vmatrix} + \begin{vmatrix} d & c \\ b & a \end{vmatrix}$
20. What happens if each element in a now or column of a determinant is multiplied by a constant ?

Set Theory

21. What is proper subset ?
22. What do you mean by equivalent set ?
23. What is universal set ?
24. What do you mean by complement of a set ?
25. Write the commutative law of set.
26. What is set builder method of presenting set ?
27. What do you mean by symmetric difference of sets ?
28. If n (A) = 25 n (B) = 30 n $(A \cap B)=10$). What is n (AUB) ?
29. What is the difference between equal and equivalent set.
30. What is roster or tabular method of presenting set ?
31. What do you mean by cardinal number of set ?

32. What do you mean by equal sets ?

33. What is a single ton set ?

34. What is an empty set ?

35. What is Venn diagram ?

Function

36. What do you mean by inverse function ?

37. What in an exponential function ?

38. What is an implicit function ?

39. What do you mean by domain of a function ?

40. What is a linear function ?

41. What is a real function ?

42. What do you mean by range of a function ?

43. What is an even function ?

44. What is a function ?

45. What is an one - one into function ?

Unit - II

Limit

46. When limit of a function does exist?

47. What do you mean by a continuous function ?

48. What do you mean by x tends to a from the left ?

49. $\lim_{x \to 1}$ $(x^4 - 2x^3 + 3x^2 + 10x^{-3})$, Evaluate

50. What do you mean by x tends to a from the right ?

51. How the limit of the sum of any two or more function is determined ?

52. How the limit of the quotient of any two function is determined ?

53. Define limit.

54. Find the LHL.
$(x^2 + 3)$ $x \to 3$.

55. Find the value of
$\lim_{x \to 3} \frac{x^2 + x - 12}{x - 3}$

Differentiation

56. Write the product rule of differentiation.

57. What do you mean by differentiation by first principle ?

58. What is differential co-efficient ?

59. Symbolically write the quotient rule of differentiation.

60. Write the chain rule used to differentiate a composite function.

61. Differentiate a function f at a as per the first principle.

62. Write the standard form of differentiation of a constant with any function.

63. Differentiate $y = \frac{1}{x^4}$

64. Differentiate $y = 5x + x^3$

65. Differentiate $y = \frac{x}{\sqrt{3}}$

Integration

66. What do you mean by integration ?

67. Write the important methods of finding integral.

68. $\int 5x^3 \, dx$

69. $\int 5^x \, dx$

70. $\int 3 - 2x \, dx$

71. $\int 3x^6 \, dx$

72. $\int \sqrt[3]{x} \, dx$

73. $\int \frac{5}{x^3} \, dx$

74. $\int 5\, 2x \, dx$

75. $\int 5 \times 3^x \, dx$

Unit - III

Mean

76. What is Central Value ?

77. What do you mean by measure of central tendency ?

78. What is weighted A.M ?

79. Write any one mathematical property of A.M.

80. What do you mean by arithmetic mean ?

81. Name the different measures of central tendency.

82. How many types of A.M. are there ?

83. What do you mean by inclusive series ?

84. Write one limitation of A.M.

85. What is an exclusive series ?

Geometric Mean

86. What is G.M. ?

87. Find G.M. of 2,25 and 20.

88. When it is not possible to compute G.M. ?

89. Symbolically state the relationship between G.M. A.M. and H.M.

90. When G.M. is considered as the most suitable average.

91. What is H.M. ?

92. When H.M. can not be determined?

93. Write the formula for finding H.M. in case of a discrete variable distribution.

94. Write any one limitation of H.M.

95. Find the H.M. of 2 and 4.

Median

96. What is a positional average?

97. What is median ?

98. Write one limitation of median.

99. What is a percentile ?

100. When median is considered as the most suitable average ?

101. Write one important merit of median.

102. What do you mean by mode ?

103. State one difference between mode and mean.

104. Mention any two merits of mode.

105. State one limitations of mode.

106. Write any two methods used for determining mode.

107. Mention the formula used under Karl Pearson empirical method of determining mode.

108. Find the value of mode if mean and median of a series are 30 and 25 respectively.

109. What do you mean by a multi-modal series ?

Unit - IV

110. What is range ?

111. What s a positional measure of dispersion ?

112. Which measure of dispersion is least affected by extreme values.

113. State one disadvantage of quartile deviation.

114. Name two positional measures of dispersion.

115. What is an absolute measure of dispersion ?

116. What is a relative measure of dispersion ?

117. Write any merit of range.

118. Write one limitation of range.

119. Find out the co-efficient of range from the following data.

35, 30, 42, 52, 50, 55

120. Define standard deviation.

121. Find the standard deviation if $\bar{x} = 6$, $Ex = 60$ and $\sum x^2 = 100$

122. Write the relationship among Q.D, M.D and S.D. in a normal distribution.

123. Write any one advantage of S.D.

124. Write any limitation of M.D.

125. Write the difference between M.D. and S.D.

126. What is the use of co-efficient of variation ?

127. What is co-efficient of variation ?

128. Write the formula used to find out co-efficient of variation.

129. Write the formula for calculation of mean deviation of an individual series.

130. Why median is the preferred average for calculation of mean deviation ?

Answer Keys

1. Matrices having equal number of rows and columns are equivalent matrices.
2. A small matrix obtained by deleting rows / columns of a given matrix is called a submatrix.
3. A square matrix in which all the leading diagonal elements are unity (1) and all other elements are zeroes is called a unity or identity matrix.
4. For matrix multiplication the number of columns in the multiplicand matrix (n) must be equal to the number of rows in the multiplier matrix. (m)
5. The magnitude of the order of the matrix refers to the number of rows and columns with which a matrix is constituted.
6. The condition necessary for invention of a matrix is, it must be a non singular one i.e. its determinant must not be zero.
7. A matrix is an orderly arrangement of some number and symbols in certain rows and columns enclosed by some brackets subscripted by magnitude of its order and denominated by some capital letter.
8. A square matrix in which the elements of rows are the respective elements of the corresponding column is call symmetric matrix.
9. When one matrix is multiplied by another matrix, it is called multiplication proper.
10. Matrix having equal number of rows and columns is called a square matrix.

Determinant

11. Minor of an element of a matrix mean the element or sub-square matrix of the given matrix along which the particular element (aij) does not exist.
12. Co-factor of an element is found out by multiplying the minor of the element with -1 to the power row number plus column number of the concerned element. i.e. $(-1)^{ij}$ X Mij
13. $\begin{vmatrix} x & 4 \\ 2 & 4 \end{vmatrix} = \begin{vmatrix} 5 & 4 \\ 2 & 3 \end{vmatrix}$

    $= 4x - 8 = 15 - 8$

    $= 4x - 8 = 15 - 8$

    $= 4x = 7 + 8 = 15$

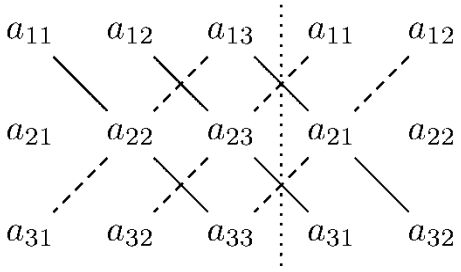
    $x = \frac{15}{4}$

14. $\begin{vmatrix} 1+2 & 1 & 5 \\ 3+6 & 3 & 6 \\ 2+4 & 2 & 7 \end{vmatrix}$

    $= \begin{vmatrix} 1 & 1 & 5 \\ 3 & 3 & 6 \\ 2 & 2 & 7 \end{vmatrix} + \begin{vmatrix} 2 & 1 & 5 \\ 6 & 3 & 6 \\ 4 & 2 & 7 \end{vmatrix}$

15. (i) The value of a determinant becomes zero if any row/ column of the same consists of zeroes only.

    (ii) The value of the determinant becomes zero if any row or column of the same are identical. (Any one from 9 properties).

16. 

17. $\begin{vmatrix} 0 & 0 & 5 \\ 5 & 4 & 2 \\ 3 & 8 & 6 \end{vmatrix} = 0\begin{vmatrix} 4 & 2 \\ 8 & 6 \end{vmatrix} - 0\begin{vmatrix} 5 & 2 \\ 3 & 6 \end{vmatrix} + 5\begin{vmatrix} 5 & 4 \\ 3 & 8 \end{vmatrix}$

= 0 - 0 + 5 (40 - 12) = 140

18. A determinant with three columns and three rows is a 3rd order determinant.

Example : $\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

$\begin{vmatrix} a & b \\ c & d \end{vmatrix} + \begin{vmatrix} d & c \\ b & a \end{vmatrix}$

ad - cb + ad - bc

= 2 (ad - bc)

20. If each element of a row / column of a determinant is multiplied by a constant the value of the determinant is also multiplied by the same constant.

Set Theory

21. If each and every element of set A is the element of set B and there exist at least one element of set B that does not belong to set A, then the set A is called proper subset of set B.

22. Two sets are said to be equivalent sets if they have same number of elements.

23. A set which contains the elements of all sets under consideration is called universal set.

24. If A is any set and E is its universal set then the complement of set A is the set of all those elements in E which are not present in A.

25. Commutative Laws.

$A \cup B = B \cup A$, $A \cap B = B \cap A$, $A - B \neq B - A$

26. Under set builder method a set is presented by describing the common characteristic of the elements within curly brackets.

27. If A and B are two non - empty sets then symmetric difference of the set A and B is the Set (A-B) $\cup$ (B-A).

28. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

= 25 + 30 - 10

= 45

29. Sets with same cardinal numbers are equivalent sets but sets having same elements and same cardinal numbers equal sets.

30. Roster or tabular method is a method of recording set under which all the elements of a set are listed and put inside cully brackets being separated by commas.

31. The cardinal number of set means the number of elements a set contain.

32. When sets have exactly the same elements they are said to be equal sets.

33. A set containing only one element is called a single ton set.

34. A set containing no element is called a null, empty or void set and denoted by the symbol Φ.

35. Venn diagram is a method of presenting sets and set operations in pictorial form, normally by circle, rectangle or square.

Function

36. The function that is obtained by interchanging the order pairs of a one - one on to function is called an inverse function.

37. A function in which the independent variable occurs as the power or exponent is called an exponential function ($Y = a^x$)

38. When a function cannot be expressed directly in terms of the independent variable it is called an implicit function.

39. The set of all pre images of a function is called the domain of the function.

40. It is a function in which the highest power of independent variable is one. It is in the form $f(x) = ax + b$

41. A real function has the set of real numbers or one of its subsets, both as its domain and as its range.

42. The range of the function is the set of images.

43. A function is said to be even it $f(x) = f(-x)$ for all values of x.

44. A function from a set A to a set B is a specific type of relation for which every element x of set A has one and only one image y in set B.

45. A function is called one - one into if different element in x have different images in Y and no single element in y in left unrelated.

Unit – II

Limit

46. The limit of a function exists if and only if both the RHL and LHL exist and both are equal.

47. A function is said to be continuous at a point / interval if in it graph there is no break in that point or interval.

48. x tends to 'a' from the left ($x \to a^-$) means the value of x successively increases and ultimately approaches very nearer to a'.

49. $\text{Lim}_{x \to 1} (x^4 - 2x^3 + 3x^2 + 10x^{-3})$
$= (1)^4 - 2(1)^3 + 3(1)^2 + 10.1^{-3}$
$= 1 - 2 + 3 + 10 - 3 = 12$

50. $x$tends to a' from the right ($x \to a^+$) mean the value of x decreases and ultimately approaches very nearer to a.

51. The limit of the sum of two or more functions is equal to the sum of the limits of the function

$$\lim_{x \to a} \{(x) + g(x)\} = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$$

52. The limit of the quotient of any two function is the quotient of the limits of the functions.

$$\left(\lim_{x \to a} \frac{f(x)}{g(x)} \right) = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$$

53. L in said to be limit of the function f(x) as x approaches a, if the difference between L and f(x) can be made as small as possible by taking x sufficiently nearer to a and is denoted symbolically as $\text{Lim } f(x) = L$

54. $\lim_{x \to 3} (x^2 + 3)$

$= \lim_{h \to 0} \{(3 - h)^{2\ x \to a} + 3\}$

$= \lim_{h-0} (9 - 6h + h^2 + 3)$

$\lim_{h \to 0} (9 - 0 + 0 + 3)$

$= 12$

55. $\lim_{x \to 3} \frac{x^2 + x - 12}{x - 3}$

$= \lim_{x \to 3} \frac{x^2 + 4x - 3x - 12}{x - 3}$

$= \frac{x(x-3) + 4(x-3)}{(x-3)} = (x + 4)$

$= \lim_{x \leftarrow 3} (3 + 4) = 7$

Differentiation

56. The derivative of the product of the functions is equal to the product of the 2nd function and derivative of the first function plus the product of 1st function and derivative of the second function.

57. If the derivative of a function is obtained by using the definition, then it is called differentiation by first principle.

58. Differential co-efficient is the limit of the ratio of increment in the dependent variable (y) corresponding to a small increment in the independent variable (x) as the latter tends to zero.

59. If u and v are two differentiable function of x and $v \neq 0$ then

$$\frac{d}{dx}\frac{u}{v} = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$$

60. If y = f (u) and u - f(x)

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

61. $\frac{d}{dx} f(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$

62. $\frac{d}{dx}\{(c.f(x)\} = c.\frac{d}{dx} f(x)$

63. $\frac{dy}{dx}\left(\frac{1}{4}\right) \left(\frac{d}{dx} x^{-4} = -4x^{-4-1} = -4x^{-5}\right)$

64. $\frac{dy}{dx}(5x + x^3) = \frac{d}{dx}5x + \frac{d}{dx}x^3 = 5\frac{d}{dx}x + \frac{d}{dx}x^3$

$= 5(1) + 3x^2 = 5 + 3x^2$

65. $\frac{dy}{dx}\left(\frac{x}{\sqrt{3}}\right) = \frac{1}{\sqrt{3}}\frac{d}{dx}(x) = 3^{-2}.1 = 3$

Integration

66. Integration is the process of finding out the functional relationship between any two or more variables from the rate of change existing between them.

67. Important methods used for finding integration are : integration by substitution, integration by parts and integration by partial fraction.

68. $\int 5x^3\, dx = 5\int x^3 dx$

$= 5\ \frac{x^3 + 1}{3 + 1} + C = \frac{5x^4}{4} C = \frac{5}{4}x^4 + C$

69. $\int 5^x \, dx = \frac{5^x}{Log_e 5} + C$

70. $\int 3 - 2x = \int (3 - 2x) \, dx$

$= \int 3 \, dx \int 2x \, dx$

$= 3 \int dx - 2 \int x \, dx + c$

$= 3x - \frac{2x^2}{2} + C = 3x = x^2 + C$

71. $\int 3x_6 \, dx$

$= 3 \int x^6 \, dx + C$

$= 3 \frac{x^7}{7} + C = \frac{3}{7} x^7 + C$

73. $\frac{5}{x^3} + dx = 5 \int x^{-3} dx$

$= 5 \frac{x^{-3} + 1}{-3 + 1} + C = \frac{x^{-2} + 1}{-2} + \Sigma$

$= \frac{-5}{2x^2} + C$

74. $\int 5^{2x} \, dx = \frac{5^{2x}}{2 \text{Log e}^5} + C$

75. $\int 5 \times 3^x \, dx = 5 \int 3^x dx$

$= 5 \frac{3x}{\text{Log}_e 3} + C$

Unit III

76. Central value is a single typical value which is the best representative of a group of values.

77. Measures of central tendency refers to a group of statistical methods those are being used to find out the central value or average value.

78. When different weights are assigned to different values in a series according to their importance and their A.M. is found out, that is called weighted A.M.

79. The algebraic sum of deviations from A.M. is zero. Symbolically $\sum (X - \overline{X}) = 0$

80. Arithmetic mean is a central value which is obtained by dividing the total valuesof the distribution by their number.

81. Different measures of central tendency are mean, median, mode, geometric mean and harmonic mean.

82. There are two types of A.M. simple A.M. and weighted A.M.

83. Continuous classes such as 5-9, 10-14, 15-19 are inclusive type series where both lower and upper limits are included in the class.

84. The most important limitation of A.M. is it is affected by extreme values.

85. Series containing classes like 0-5, 5-10, 10-15 and so or are exclusive type where upper limits are excluded from the respective classes.

Geometric Mean

86. Geometric mean of a set of 'n' observations is the nth root of their product.

87. G.M. = $3\sqrt{2\times25\times20}$

= $3\sqrt{1000}$

= 10

88. G.M. can not be computed in a series having zero or negative values.

89. Symbolically the relationship between G.M.A.M. and H.M. is : A.M.$\geq$ G.M. $\geq$ H.M.

90. G.M. is considered to be most suitable for averaging ratios and percentages.

Harmonic Mean

91. Harmonic mean is the reciprocal of the A.M. of the raciprocals of the items of a series.

92. H.M. can not be determined when the items of the variable have both negative and positive values or if one item is zero.

93. H.M. = $\frac{N}{\sum\left(f\times\frac{1}{x}\right)}$ or $\frac{N}{\sum(F/X)}$

94. It is not easy to understand and calculate.

95. H.M. = $\frac{2}{\frac{1}{2}+\frac{1}{4}}=\frac{2}{\frac{3}{4}}=\frac{2\times4}{3}=\frac{8}{3}=2.67$

Median

96. Positional averages are existing values picked out only by identifying their position or picked out only by identifying their position or location in a series.

97. Median is the middle most of the central value of the variable when the values are arranged in order of magnitude.

98. It is not suitable for further mathematical treatment. It does not take into account all the values in the series.

99. Percentile is a partition value that divides a series into 100 equal parts.

100. Median is considered as the most suitable average for grouped data with open ended classes or when all the values in a series is not known.

101. The most important merit of median is, it is not affected by extreme values. It is simple to calculate and understand.

Mode

102. Mode is the value that occurs most frequently in a series.

103. For calculation of mean all items of observations are taken into consideration but for calculation of mode all items are not required.

104. Mode is not affected by extreme values and gives the most representative value of a series.

105. The most important demerit of mode is it is not rigidly defined, hence one may get different values.

106. Methods of determining mode are :
    (i) By inspection.
    (ii) By grouping and analysis.
    (iii) By graph.
    (iv) By empirical relation.

107. Under Karl pearsons empirical method Mode = 3 Median - 2 Mean.

108. Find out the value of Mode = 3 Median - 2 Mode.

    = 3 x 23 - 2 x 20 = 75 - 60 = 15

109. A series having more than two modes i.e. multiple modes is called a multi model series.

Unit - IV

110. The difference between the highest and lowest value in a series is range.

111. Positional measures describe the spread or scatter among values of variables taking into account position of the variable in a distribution.

112. Inter quartile range and quartile deviation are least affected by extreme values.

113. Quartile deviation is not based on all the observations of a series.

114. Range and Quartile deviation are two important positional measures of dispersion.

115. A measure of dispersion which is expressed in the same statistical unit in which the original data are collected is called an absolute measure of dispersion.

116. A relative measure is the ratio or co-efficient of an absolute measure of dispersion to ore appropriate average.

117. One important merit of range is it is simple to understand and easy to calculate.

118. One demerit of range is it is not based on all the values of the observation.

119. Co-efficient of range is

$$\frac{L-S}{L+S}=\frac{55-30}{55+30}$$

$$=\frac{25}{85}=\frac{5}{17}$$

120. The positive square root of the A.M. of the square of deviations of the values of the distribution from its arithmetic mean is called standard deviation.

121. $\bar{x} = \frac{\Sigma x}{N} = 6 \quad \therefore \frac{60}{N} = 6 \quad \therefore N = 10$

$$\sigma = \sqrt{\frac{\sum x^2}{N} - (\bar{x})^2}$$

$$\frac{1000}{10} - (6)^2$$

$$\sqrt{100 - 36} = \sqrt{64} = 8$$

122. In a normal distribution the relationship among.
Q.D, M.D. and S.D. is
Q.D. < M.D. < S.D. and their ratio is
10 : 12 : 15

123. The advantages of S.D. are it is based on all the values and rigidly defined.

124. One limitation of M.D. is it is not capable of further mathematical treatment.

125. Standard deviation is calculated from A.M. only whereas M.D. can be calculated by using A.M. or Median or Mode.

126. Co-efficient of variation is used to compare the variability, homegenity, stability, consistency and uniformity of two or more series.

127. Co-efficient of variation is a relative measure of dispersion used to compare the variability of two or more series.

128. Formula used to find out co-efficient of variation is. $\frac{\sigma}{\bar{x}} X 100$

Where σ- S.D. $\bar{x}$ = Mean.

129. M.D. = $\frac{\sum |D|}{N} |D| = X - \bar{X}$ ignoring '+' and '_' signs.

130. Median is the preferred average for calculation of M.D. because deviations of x values from median, ignoring '+' and '-' signs is the least.

GROUP - B

Answer the following within 30 words each one.

Matrix

1. Write the condition necessary for multiplication of two matrices.
2. Write the properties of matrix multiplication proper.
3. What is a transposed matrix ? Explain with example.
4. Find the product of $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \end{pmatrix}$
5. Present the following linear equation is form of matrix.

   $2x + 3y = 13$

   $5x + 2y = 16$
6. Find the co-factor matrix of $\begin{pmatrix} 5 & 10 \\ 15 & 20 \end{pmatrix}$
7. What is a symmetric matrix ? Give an example.
8. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}_{2 \times 2}$ $B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}_{2 \times 2}$ find A + B
9. Explain a scalar matrix with example.
10. Differentiate between equal and equivalent matrices.

Determinant

11. Evaluate using sarrus diagram.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

12. What is a 3rd order determinant ? Explain with example.
13. Evaluate $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{vmatrix}$
14. What do you mean by co-factor of an element ?

15. Express the following as sum of two determinants.

$$\begin{vmatrix} 2+3 & 6 & 7 \\ 3+1 & 8 & 9 \\ 4+2 & 10 & 11 \end{vmatrix}$$

16. Evaluate the determinant using appropriate property

$$\begin{vmatrix} 3 & 1 & 4 \\ 15 & 5 & 16 \\ 18 & 6 & 18 \end{vmatrix}$$

17. Determine the value of $|A| = \begin{vmatrix} 2 & 3 \\ 1 & 5 \end{vmatrix}$ by Co-factor expansion method.

18. $|A| = \begin{vmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \\ 4 & 5 & 6 \end{vmatrix}$ Find the Co-factor of element 7.

Set Theory

19. Differentiate between equal and equivalent set

20. What is a power set ? Explain with example.

21. What do you mean by complement of a set ?

22. What do you mean by symmetric difference of sets. Explain with example.

23. If n (A) = 35 n (b) 40 and n (A$\cap$B) = 15, Find n (A$\cup$B)

24. Write the De-Morgans' Laws.

25. If A = {1,2,3,4} B = {2, 4, 10, 12}

    Find A$\cup$B and A$\cap$B

26. If A = $\{x : x^2 - 4x = 0\}$ and B = $\{0,1\}$ Find A $\cap$ B.

27. Prove that A$\cup$(A$\cap$B) = A

28. What is a proper subset ? Explain with example.

Function

29. What do you mean by domain and range of a function ?

30. What is an inverse function ? Explain with example.

31. Test whether function Y = $2x^4 + 3x^2$ is odd or even.

32. Find the inverse of f(x) = $3x^3 - 2$

33. If f (x) = x+1 and g(x) = x^2 -1 find fog.

34. If domain of f (1,2,3,4) and f(z) = 2x -1 then find the range of the function.

35. What is one one into function ? Explain with example.

36. What is a function.

37. Show that f(x) = 7x^6 + 3 x^4 + 2 x^2 + 4 is an even function.

38. Show that f(x) = $\frac{1}{x^3}$ is an odd function.

Unit - III

Limit & Continuity

39. State when limit of a function does not exist.

40. Find out the value of $\lim_{x \to a} \frac{x^3 - a^3}{x - a}$

41. Find the value of $\lim_{x \to 1} \frac{x^3 + 1}{x + 1}$

42. Evaluate $\lim_{x \to} \frac{x^2 + x - 12}{x - 3}$

43. Find the LHL of $\lim_{x \to 5} \frac{x + 5}{x - 5}$

44. Write the conditions of a functions continuity at x = a

45. Name any two continuous function.

46. Evaluate $\lim_{x \to 0} \frac{x^2 + 2x}{2x}$

47. What do you mean by limit ?

48. What do you mean by x tends to a from the left.

Differentiation

49. Differentiate y = 2x^2 + 3 x

50. Differentiate y = x + $\frac{1}{x}$

51. Differentiate y = $5\frac{5}{\sqrt{x}}$

52. Write the product rule of differentiation

53. Write the quotient rule of differentiation

54. Differentiate $y = x^{11} - x^{10} + 15$

55. Write the chain rule used to find the derivative of a composite function.

56. What is partial differentiation ?

57. Find the second order differential co-efficient $y = 3x^3 - 9x$

58. Differentiate $y = x^3 e^x$

59. Differentiate $\frac{x^2}{e^x}$

60. Differentiate $\frac{x^3}{x^3+2}$

Integration

61. Evaluate $\int \frac{x}{5}\, dx$

62. Evaluate $\int x^{n+1}\, dx$

63. Evaluate $\int 8 - 9x - x^5\, dx$

64. Evaluate $\int 5^x\, dx$

65. Evaluate $\int \frac{x^4+1}{x^2}\, dx$

66. Write the three important methods of integration.

67. What is indefinite integration ?

68. Evaluate $\int \left(x + \frac{1}{x} \right) dx$

69. Evaluate $\int 7 \times 5^x\, dx$

70. Evaluate $\int (x-1)^2\, dx$

Unit - III

Measures of Central tendency

71. Write any two merits of A.M.

72. Write any two demerits of A.M.

73. Write any two mathematical properties of A.M.

74. Write any two features of an ideal measure of central tendency.

75. Write the difference between mathematical average and positional average.

76. What do you mean by measure of Central Tendency ?

77. State the limitations of G.M.

78. Calculate the H.M. of 2, 5, 10, 20.

79. Write the relationship between A.M. G.M. and H.M.

80. The mean of 9 values was 25. But by mistake a value was taken as 32 instead of 23. What is the correct mean ?

81. Write two objectives of a measure of Central Tendency.

82. Find the G.M. of 3, 9 and 27.

83. Find the individual frequency of each class from the following data.

Marks below	10	20	30	40	50
No. of Students	8	20	36	71	100

84. The average wage of 30 men and 20 women in a factory is Rs.120. If the average wage of men is Rs.140 what is the average wage of women.

85. Find the A.M. of 1st 20 natural numbers.

86. What do you mean by median ?

87. Write any two merits of median.

88. Write any two limitations of median.

89. When median is considered as the most suitable average ?

90. Write the interpolation formula used to locate median from the median class in a continuous distribution.

91. Mention the steps you will take to locate median in a discrete series.

92. Write different methods of determining mode.

93. Mention two merits of mode.

94. State two demertis of mode.

95. State the empirical relationship between mean, median and mode.

96. What is a quartile.

97. What is a percentile ?

98. A.M. and mode of a moderately assymmetric distribution are 60.4 and 50.2 respectively.

Find the median.

98. Find the median from the following data.

Marks	20	25	30	35	40	45	50
No. of Students 18	30	32	45	25	17	13	

99. Write formula for calculation of mode in a continuous series.

100. Compare the A.M. and G.M. of three items 2, 4, 8.

Unit - IV

102. Write any two features of an ideal measure of dispersion.

103. Write any two objectives of dispersion.

104. State different types of measure of dispersion.

105. Write any two limitations of range.

106. Name any four absolute measure of dispersion.

107. State the merits of Quartile deviation.

108. Mention the steps necessary for calculation of mean deviation.

109. State the merits of M.D.

110. Write any two demerits of M.D.

111. Write any two advantages of S.D.

112. Why standard deviation is called best among the measures of dispersion ?

113. The mean and standard deviation of a normal distribution is 30 and 5. Find out the highest and lowest value in the distribution.

114. What do you mean by standard deviation is independent of change in origin ?

115. Write the differences between M.D. and S.D.

116. From the following data find out which bats man is more consistent.

	Avg. Score	S.D.
Virat	52	5
Rohit	58	7

Answer Keys

1. The condition necessary for multiplication of two matrices is the number of column in the multiplicand matrix (n_1) must be equal to the number of rows in the multiplier matrix. (m_2) Symbolically $n_1 = m_2$.

2. The properties of multiplication proper are :

   (i) It is not commutative $AB \neq BA$.

   (ii) It is associative, means (AB) C = A (BC)

   (iii) It is distributive over addition means A (B+C) = AB + AC

3. A matrix which is obtained by changing rows into their respective columns or columns into their respective rows is called a transposed matrix.

   If $A = \begin{pmatrix} 1, & 2, & 3, & 4 \\ 5, & 6, & 7, & 8 \end{pmatrix}$ The Transpose of A or $A^t = \begin{pmatrix} 1 & 5 \\ 2 & 6 \\ 3 & 7 \\ 4 & 8 \end{pmatrix}$

4. $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}\begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 1\times 2 + 2\times 3 \\ 3\times 2 + 3\times 4 \end{pmatrix} = \begin{pmatrix} 2 + 6 \\ 6 + 12 \end{pmatrix} = \begin{pmatrix} 8 \\ 18 \end{pmatrix}$

5. $\begin{pmatrix} 2 & 3 \\ 5 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 13 \\ 16 \end{pmatrix}$

6. $\begin{pmatrix} 5 & 10 \\ 15 & 20 \end{pmatrix} = \begin{vmatrix} 5 & 10 \\ 15 & 20 \end{vmatrix}$

   $C_{11} = +20$ $C_{12} = -15$ $C_{21} = -10$ $C_{22} = +5$

   The matrix of co-factor. $\begin{pmatrix} 20 & -15 \\ -10 & 5 \end{pmatrix}$

7. A square matrix in which the elements of rows are the respective elements of the corresponding columns is called a symmetric matrix. The columns is called a symmetric matrix. The transpose of such a matrix is the matrix itself.

   Example $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{pmatrix} = A^t$

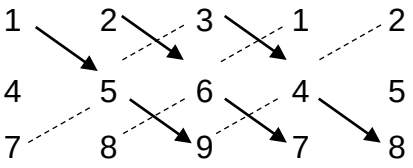
8. $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$

$A + B = \begin{pmatrix} 1+5 & 2+6 \\ 3+7 & 4+8 \end{pmatrix} = \begin{pmatrix} 6 & 8 \\ 10 & 12 \end{pmatrix}_{2\times2}$

9. A square matrix in which all the elements except those in the main diagonal are zeroes and all the leading diagonal elements are equal is called a scalar matrix.

Example $\begin{pmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{pmatrix}$

10. A matrix is said to be equal with another matrix if all its elements are equal to the corresponding elements of the said another matrix. But they are equivalent if number of rows and columns of both the matrices are equal. So all the equal matrices are equivalent but all equivalent matrices are not equal.

11. 

(1 X 5 X 9) + (2 X 6 X 7) + (3 x 4 X 8) - (7X5X3)

- (8 X 6 X 1) - (9 X 4 X 2)

= 45 + 84 + 96 - 105 - 48 - 72

= 225 - 225 = 0

13. A determinant with 3 rows and 3 columns is a 3rd order determinant. It has nine elements. The example of a 3rd order determinant is : $\begin{vmatrix} 2 & 5 & 6 \\ 7 & 8 & 9 \\ 10 & 11 & 12 \end{vmatrix}$

13. $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{vmatrix} = 1\begin{vmatrix} 4 & 5 \\ 5 & 6 \end{vmatrix} - 2\begin{vmatrix} 2 & 5 \\ 3 & 6 \end{vmatrix} + 3\begin{vmatrix} 2 & 4 \\ 3 & 5 \end{vmatrix}$

= 1 (24 - 25) - 2 (12 - 15) + 3 (10 - 12)

= -1 - (-3) + 3 (-2)

= -1 + 3 – 6 = -4

14. Co-factor of an element means the product of $(-1)^{i+j}$ and the minor of the concerned element (Mij) $(-1)^{i+j}$ and the minor of the concerned element (Mij) Symbolically Cij = $(-1)^{i+j}$ Mij.

15. Where Cij is the co-factor of the element in 'i' th row and 'j' th column.

$$\begin{vmatrix} 2+3 & 6 & 7 \\ 3+1 & 8 & 9 \\ 4+2 & 10 & 11 \end{vmatrix} = \begin{vmatrix} 2 & 6 & 7 \\ 3 & 8 & 9 \\ 4 & 10 & 11 \end{vmatrix} + \begin{vmatrix} 3 & 6 & 7 \\ 1 & 8 & 9 \\ 2 & 10 & 11 \end{vmatrix}$$

16. $$\begin{vmatrix} 3 & 1 & 4 \\ 15 & 5 & 16 \\ 18 & 6 & 18 \end{vmatrix} = \begin{vmatrix} 1\times 3 & 1 & 4 \\ 5\times 3 & 5 & 16 \\ 6\times 3 & 6 & 18 \end{vmatrix} = 3 \begin{vmatrix} 1 & 1 & 4 \\ 5 & 5 & 16 \\ 6 & 6 & 18 \end{vmatrix} = 3 \text{ X } 0 = 0$$

17. $|A| = a_{11} C_{11} + A_{12} C_{12} |A| = \begin{vmatrix} 2 & 3 \\ 1 & 5 \end{vmatrix}$

$a_{11} - 2\, a_{12} = 3$

$C_{11} = (-1)^{1+1} M_{11} = 5$ $C_{12} = (-1)^{1+2} M_{12} = -1$

$|A| = 2 \text{ X } 5 + 3\,(-1) = 10 - 3 = 7$

18. 7 is a_{23} element.

Co-factor of 7 = $(-1)^{2+3} M_{23}$

$= (-1)5 \begin{vmatrix} 5 & 6 \\ 4 & 5 \end{vmatrix} = -1.\,(25 - 24) = -1$

Set Theory

19. Two sets A and B are said to be equal if all the elements of A belong to B and all elements of B belong to A. Equal sets are identical sets. Sets are equivalent if they have same number of elements symbolically the condition of equivalency is n(A) =n (B).

20. A collection or family of all subsets of a set is called its power set. Thus if A is a set then power set of A or P(A) = $\{x ! x \underline{C} A\}$

For example Let A = $\{p\, q\, r\}$

Then P (A) = {(p) (q) (r) (pq) (p,r) (q,r) (pqr) Φ}

21. Complement of a set is the set which contains all the elements of universal set, those are not in A and in denoted by A'. Thus A' is U-A. For example U (universal set) = (a, b, c, d, e, f, g, h) A = (a, b, c,d) A^1 (e, f, g, h)

22. A and B are two sets then their symmetric difference is equal to (A-B) U (B-A). Symbolically it is written as AΔ B.

Example Let A = {1, 2, 3, 4, 5} B = {3, 4, 5, 6, 7}

$\therefore$ A - B = {1, 2}, {B - A] = {6, 7}

AΔ B = (A-B) U (B-A)

= {1, 2, 6, 7}

23. If n (A) = 35 n (B) = 40 n (A$\cap$B) = 15

n (A$\cup$B) = n (A) + n (B) - n (A$\cap$B)

= 35 + 40 - 15.

= 60.

24. The De-Morgan's Laws are

(i) (A$\cup$B)' - A'$\cap$B'

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

25. A = {1, 2, 3, 4}

B = {2, 4, 10, 12}

A $\cup$ B = {1, 2, 3, 4, 10, 12}

A$\cap$ B = {2, 4}

26. A = {x : x^2 - 4x = 0}

$\therefore$ x^2 - 4x = 0

x^2 = 4x

x = 4 $\therefore$ A = {4}.

A$\cap$B = {4} $\cap$ {0.1} = Φ

27. Let A = {P, q, r}

B={r, s, t, l}

A$\cap$B = {r}

A$\cup${A$\cap$B} = {p, q, r} = A

28. Let A and B are two sets. If each and every element of set A is an element of set B and their exist at least one element in set B which is not an element of A then A is called the proper subset of B and B its super set. Symbolically A$\subset$B and B$\supset$A.

Example A = {1,2,3,4} B = {1, 2, 3, 4, 5,6}

$\therefore$ A $\subset$ B and B $\supset$ A

29. The set of all the pre-images of a function is called the domain of the function. The range of the function is the set of images.

30. A function which is obtained by inter changing the ordered pairs of a one one on to function is called inverse function and is denoted by f^{-1}.

Example A = (a, b, c, d)

B = (1, 2, 3, 4)

f A $\rightarrow$B = {(a,1) (b,2) (c 3) (d 4)

f^{-1}= {1a) (2b) (3c) (4d)

31. $y = f(x) = 2x^4 + 3x^2$

$\therefore f(-x) = ((-x)^4 + 3(-x)^2$

$= 2x^4 + 3x^2$

$= f(x)$

$f(-x) = f(x)$ $\therefore$ The function is even.

32. $f(x) = y = 3x^3 - 2$

$\therefore \quad 3x^3 = y + 2$

$x^3 = \frac{y+2}{3}$ $x = \left(\frac{y+2}{2}\right)^{1/3}$

$\therefore \quad f^{-1} = (y - x) = \left(\frac{y+2}{3}\right)^{1/3}$

33. Given $f(x) = x + 1$, $g(x) = x^2 - 1$

$\therefore$ fog = fog (x) = f (g(x))

$= f(x^2 - 1)$

$= x^2 - 1 + 1 = x^2$

34. Given domain 1, 2, 3, 4

$f(x) = 2x^{-1}$

Hence the range of the function is

$f(1) = 2 \times 1 - 1 = 1$

f(2) = 2 x 2 -1 = 3

f (3) = 2 x 3 - 1 = 5

f (4) = 2 x 4 - 1 = 7

The range is 1, 3, 5, 7.

35. A function f : A $\rightarrow$ B is called one one into if different elements of A have different images in B and there is at least one element in B which is not the image of any element in A.

Let A = (1, 2, 3) f (x) = $x^2 + 1$

B = (1, 5, 10, 12)

f A $\rightarrow$B = {(1,1) (2,5) (3,10)} is a one into function.

36. A function f form set A to a set B is a specific type of relation for which every element x of set A has one and only one image y in set B. It is written as

f : A $\rightarrow$ B where f (x) = y.

37. f (x) = $7x^6 + 3x^4 - 2x^2 + 4$

f (-x) = $7 (-x)^6 + 3 (-x)^4 - 2 (-x)^2 + 4$

= $7x^6 + 3x^4 - 2x^2 + 4$

f (x) = f (-x) $\therefore$ f (x) is an even function.

38. f (x) = $\frac{1}{(-x)^3} = \frac{1}{x^3} = -\frac{1}{x^3}$

f (-x) = -f (x) $\therefore$ f (x) is an add function.

Limit & Continuity

39. Limit of a function does not exist under the following conditions.

(i) Limit $\underset{x \rightarrow a^-}{f(x)}$ i.e. LHL does not exist.

(ii) Limit $\underset{x \rightarrow a^+}{f(x)}$ i.e. RHL does not exist.

(iii) Lim $\underset{x \rightarrow a^-}{f(x)} \neq \underset{x \rightarrow a^+}{\text{Lim}\, f(x)}$ or LHL $\neq$ RHL.

40. $\lim_{x \to a} \frac{x^3 - a^3}{x - a} = 3a^2$

$\left(\therefore \lim_{x \to a} \frac{x^n - a^n}{x \to a} = na^{n-1} \right)$

41. $\lim_{x \to 1} \frac{x^3 - 1}{x + 1} = \lim_{x \to 1} \frac{(x)^3 + (1)^3}{x + 1}$

$= \lim_{x \to 1} \frac{(x+1)(x^2 - x + 1)}{(x+1)} = \lim_{x \to 1} x^2 - x + 1)$

$= 1^2 - 1 + 1 = 1$

42. $\lim_{x \to 1} \frac{x^2 + x - 12}{x - 3}$

$= \lim_{x \to 3} \frac{x^2 + 4x - 3x - 12}{x - 3} = \lim_{x \to 3} \frac{x(x+4) - 3(x+4)}{(x-3)}$

$= \lim_{x \to 3} \frac{(x+4)(x-3)}{(x-3)} = \lim_{x \to 3} (x + 4) = 3 + 4 = 7$

43. $\lim_{x \to 5} \frac{x+5}{(x-5)} = \lim_{h \to 0} \frac{(5-h)+5}{(5-h)-5}$

$= \lim_{h \to 0} = \frac{5 - h + 5}{5 - h - 5} = \frac{10}{0} = -\infty$

44. A function is said to be continuous at x = a if following conditions are satisfied.

(i) $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x) = f(a)$

(ii) $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x)$ and f (a) are finite and have definite values.

45. Functions those are always continuous are

(i) Constant function

(ii) Identity function

(iii) Polynomial function

46. $\lim_{x \to 0} \frac{x^2 + 2x}{2x}$

$= \lim_{x \to 0} \frac{\frac{x^2}{x} + \frac{2x}{x}}{\frac{2x}{x}} = \lim_{x \to 0} \frac{x+2}{2}$

$= \frac{0+2}{2} = \frac{2}{2} = 1$

47. 'L' is said to be limit of a function f(x) as x approaches 'a', if the difference between L and f (x) can be made as small as possible by taking x sufficiently closer to a.

Symbolically = $\lim_{x \to 0} f(x) = L$

48. 'x' lends to a form the left means the value of x successively increases and ultimately approaches very nearer to a. Symbolically it is written as $x \to a^-$

Differentiation

49. $y = 2x^2 + 3x$

$\frac{dy}{dx} = \frac{d}{dx}(2x^2 + 3x)$

$= \frac{d}{dx} - (2x^2) + \frac{d}{dx}(3x)$

$= 4\, x^{2-1} + 3\, x^{1-1}$

$= 4x + 3$

50. $\frac{dy}{dx} = \frac{d}{dx}(x + \frac{1}{x})$

$= \frac{d}{dx}(x) + \frac{d}{dx}\frac{1}{x}$

$= \frac{d}{dx}(x) + \frac{d}{dx}(x^{-1})$

$= 1\, x^{1-1} + -1\ x^{-1-1}$

$= 1 + -x^{-2}$

$= 1 - x - 2 = 1 - \frac{1}{x^2}$

51. $y = \sqrt[5]{x}$

$$\frac{dy}{dx} = \frac{d}{dx}\left(\sqrt[5]{x}\right)$$

$$= \frac{d}{dx}\left(x^{-5}\right)$$

$$= -5x^{-5-1} = -5\,x^{-6} = -5\,\frac{1}{x^6}$$

52. The derivative of the product of two functions is equal to the product of the second function are derivative of the first function plus the 1st function and derivative of the second function. Thus of u and v are two differentiable function of x, then

$$\frac{d}{dx}\,uv = v\frac{d}{dx}\,u + u\frac{d}{dx}v$$

53. The derivations of the quotient of any two function is equal to the product of the denominator and derivative of the numerator minus the product of the numerator and derivative of denominator, all divided by square of the denominator.

If u and v are to differentiable function of x their

$$\frac{d}{dz}\left(\frac{u}{v}\right) = \frac{v\frac{d}{dx}\,u - u\frac{d}{dx}\angle}{\angle 2}$$

$$\frac{d}{dx} = \frac{d}{dx}\left(x^{11} - x^{10} + 15\right)$$

$$= \frac{d}{dx}\left(x^{11}\right) - \frac{d}{x}\left(x^{10}\right) + \frac{d}{x}15$$

$$= 11x^{11-1} - 10\,x^{10-1} + 0$$

$$= 11x^{10} - 10x^{9}$$

55. If y is a function of 'μ' and 'μ' is a function of x i.e. $y = f(\mu)$ $\mu = f(x)$ then.

$\frac{dy}{dx} = \frac{dy}{d\mu} x \frac{d\mu}{dx}$, which is known as chain rule.

56. Simple differentiation deals with function of one independent variable i.e. $y = f(x)$ but in partial differentiation the concept of differentiation of a function is extended to more than one independent variable i.e. $z = f(x,y)$.

57. $y = 3x^3 - 9x$

$$\frac{dy}{dx} = \frac{d}{dx}3x^3 - \frac{d}{dx}9x = 9x^2 - 9.$$

The 2nd order differential is

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d}{dx}(9x^2 - 9) = 18x.$$

58. $$\frac{dy}{dx} = (x^3e^x) = \frac{d}{dx}(x^3e^x)$$

$$= e^x\frac{d}{dx}x^3 + x^3\frac{d}{dx}e^x$$

$$= e^x\,3x^2 + x^3e^x$$

$$= e^x\,(3x^2 + x^3)$$

59. $$\frac{dy}{dx}\left(\frac{x^2}{e^x}\right) = \frac{e^x\frac{d}{dx}x^2 - x^2\frac{d}{dx}e^x}{\left(e^x\right)^2}$$

$$= \frac{e^x 2x - x^2\,e^x}{\left(e^x\right)^2} = \frac{e^x(2x - x^2)}{\left(e^x\right)^2}$$

$$= \frac{2x - x^2}{e^x} = \frac{x(2-x)}{e^x}$$

60. $$\frac{dy}{dx}\ \frac{x^3}{x^3+2} = \frac{\left(x^3+2\right)\frac{d}{dx}x^3\ \frac{d}{dx}\left(x^3+2\right)}{\left(x^3+2\right)^2}$$

$$\frac{\left(x^3+2\right)3x^2 - x^3(3x^2)}{\left(x^3+2\right)^2}$$

$$= \frac{3x^5 + 6x^2\ \ 3x^5}{\left(x^3+2\right)^2}$$

$$= \frac{6x^2}{\left(x^3+2\right)^2}$$

Integration

61. $\int \frac{x}{5}\, dx = \frac{1}{5}\int x\, dx$

$= \frac{1}{5}\ \frac{x^{1+1}}{1+1} + C$

$= \frac{1}{5}\ \frac{x^2}{2} + C = \frac{1}{10} + C$

62. $\int x^{n+1} dx = \frac{x^{n+1+1}}{n+1+1} + C = \frac{x^{n+2}}{n+2} + C$

63. $(8 - 9x - x^5)\, dx = \int 8dx - \int 9xdx - \int x^5 dx$

$= 8\int dx - 9\int xdx - \frac{x^6}{6} + C$

$= 8x\ \frac{-9x^2}{2} - \frac{x^6}{6} + C$

64. $\int 5^x\, dx = \frac{5^x}{\text{Log}_e 5} + C$

65. $y = \frac{x^4+1}{x^2} = \frac{x^4}{x^2} + \frac{1}{x^2} = x^2 + x^{-2}$

$\int x^2 + x^{-2}\, dx = \frac{x^{2+1}}{2+1} + \frac{x^{-2+1}}{-2+1} + C$

$= \frac{x}{3} + \frac{x^{-1}}{-1} + C = \frac{x^3}{3} - \frac{1}{x} + C$

66. The three important methods of integration are

(i) Integration by substitution.

(ii) Integration by parts.

(iii) Integration by partial fraction.

67. The expression g (x) + C which represents all the anti derivatives of f(x) but any definite anti derivative is called the indefinite integral of f(x). It is written as $\int f(x)\, dx$

68. $\int\left(x+\frac{1}{x}\right)dx$

$= \int x\,dx+\int\frac{1}{x}dx=\frac{x^{1+1}}{1+1}$

$= \frac{x^2}{2}+\text{Log}_e\ x+C$

69. $\int 7\times 5$

$= 7\int 5^x\,dx$

$= \frac{7.5^x}{\text{Log}5}+C$

70. $\int(x-1)^2\,dx$

$= (x-1)^2 = \int\left(x^2-1-2x\right)dx$

$= \int x^2\,de+\int 1de-2\int x\,de$

$= \frac{x^{2+1}}{2+1}+x-\frac{x^{1+1}}{1+1}+C$

$= \frac{x^3}{3}+x-\frac{2x^2}{2}+C$

$= \frac{1}{3}x^3+x-x^2+C$

Unit - III

71. Merits of A.M. are

(i) It is easy to understand and calculate.

(ii) It is based on all the values of observation.

72. The demerits of A.M. are

(i) It is unduly affected by extreme values.

(ii) For calculation of mean it is necessary to know the actual value fo all items.

73. The mathematical properties of A.M. are

(i) The sum of deviations from mean is zero.

i.e. $\sum\left(x-\bar{x}\right)=0$

(ii) The sum of square of deviations taken from mean is lowest. Symbolically $\sum\left(x-\bar{x}\right)^2 = \text{Lowest.}$

74. Ideal feature of a measure of central tendency are :

(i) It should be easy to understand and calculate.

(ii) It should take into consideration all the values in the distribution.

(iii) It should be rigidly defined.

75. A mathematical average is calculated by taking into consideration all the values in the distribution where as positional average is a locational value located or identified by its position in the distribution.

76. Measures of central tendency refers to a group of statistical methods those are being used to find out the central value or the average value or the representative value of a frequency distribution.

77. The limitations of G.M. are

(i) It is difficult to understand and calculate.

(ii) It can not be found out when a value is either xerox or negative.

78. H.M. = $\dfrac{N}{\sum\frac{1}{x}}$

H.M. of 2.5.10.20

$$\frac{4}{\frac{1}{2}+\frac{1}{5}+\frac{1}{10}+\frac{1}{20}} = \frac{4}{\frac{10+4+2+1}{20}} = \frac{4}{\frac{17}{20}}$$

$$= \frac{4\times 20}{17} = \frac{80}{17} = 4.71$$

79. The relationship between A.M. G.M. and H.M. can be stated as follows :

When all the values in a distribution are equal the A.M. G.M. and H.N. of the distribution are also equal. When the values are not equal, AM > GM > HM

80. Given $\bar{X} = 25$ N = 9

$\sum x = 25 \times 9 = 225$

The correct $\sum x = (225 - 32 + 23) = 216$

$\therefore$ Correct $\bar{X} = \frac{216}{9} = 24$

81. The main objectives of a measure of central tendency are :

(i) To present a series in precise and comprehensive manner.

(ii) To facilitate comparison between different distribution by reducing mass data into one single value.

82. G.M. = $\sqrt[n]{x_1, x_2, x_3 .... x_n}$

= $3\sqrt{3 \times 9 \times 27}$

= $3\sqrt{3 \times 3 \times 3 \times 3 \times 3 \times 3}$

= 3 X 3 = 9

83. 0 -10 8

10 - 20	12 (20 - 8)
20 - 30	16 (36 - 20)
30 -40	35 (71 - 36)
40 - 50	29 (100 - 71)

84. Total Number of Workers 30 + 20 = 50

Total wage = Avg. Wage X Number of Workers

= 120 X 50 = Rs.6000.00

Total wage of men = 140 x 30 = Rs.4200.00

Total wage of women = Rs.6000 - Rs.4200 = Rs.1800

Average wage of women = $\frac{1800}{20} = \text{Rs.}90.00$

85. The sum of 1 to 20 in $\frac{20 \times 21}{2} = 210$

$\bar{x}$ of 20 numbers in = $\frac{210}{20} = \frac{21}{2} = 10.5$

86. Median is a positional measure of central value. It lies in the middle of the distribution and divides the distribution into two equal halves. One half consists of all values smaller and the other half all values greater than the median.

87. The important merits of median are

(i) It is easy to understand and calculate.

(ii) Its determination does not require all the values of observation.

88. Limitations of median are :

(i) Its calculation is not based on all the values of observations.

(ii) It has no further mathematical use like A.M. G.M. or H.M.

89. Median is considered as the most suitable average under the following circumstances.

(i) When all the values of observations are not available.

(ii) Where numerical measurements are not possible like skill, honesty, intelligence etc.

90. Median = $L_1 + \frac{L_2 - L_1}{f_1}$ (M-C) where

L_1 = Lower limit of the median class

L_2 = Upper limit of the median class

f = Frequency of the median class.

m = $N/_2$

C = Cumulative frequency of the class proceeding median class.

91. Steps to locate median in discrete series are

(i) Arrange the data in ascending or descending order

(ii) Find the cumulative frequencies.

(iii) Find the middle value by applying the formula M= Size of $\frac{N+1}{2}$th item.

(iv) Locate the value.

92. Different methods used to determine mode are

(i) By inspection

(ii) By grouping and analysis

(iii) By Graph

(iv) By empirical relation

93. (i) It is not affected by extreme values.

(ii) It gives the most representative value of the series.

94. The demerits of mode are :

(i) It is not rigidly defined.

(ii) It is not capable of further algebraic treatment.

95. In a moderately asymmetrical distribution. The relationship between mean, median and mode is :

Mode = 3 Median - 2 Mean.

96. Quartile is a partition value that divides a series into 4 equal parts. Thus there are three quartile values. Q_1, Q_2 and Q_3. Q_1 is called the lower quartile and Q_3 in called the upper quartile.

97. Percentiles are partition values that divide a series into 100 equal parts. There are as such 99 percentiles denoted as P_1, P_2, P_3.... P_{99}. The 50th percentile is the same as the value of median as it stands just at the middle position.

98. Mode = 3 Median 2 Mode

51.2 = 3 Median = 2 x 60.4

$\therefore$ 3 Median = 52.2 + 120.8 = 173

Median = $\frac{173}{3} = 57.66$

99.

Marks	20	25	30	35	40	45	50
No. of Students	18	30	32	45	25	17	13
Cumulative Frequency	18	48	80	125	150	167	180

Median is size of $\frac{N+1}{2}$th item.

i.e. $\frac{180+1}{2} = 90.5\text{th item.}$

Thus median is 35.

100. Mode = L1 + $\frac{f_1 - f_o}{2f_1 - f_o - f_2}$ (L_2 - L_1)

Where - L_1 - Lower limit of modal class.

L_2 - Upper limit of modal class.

f_1 - frequency of the modal class.

f_0 - frequency of the class preceding modal class.

f_2 - frequency of the class succeeding modal class.

101. A.M. = $\frac{\sum x}{N}$

= $\frac{2+4+8}{3} = \frac{14}{3} = 4.67$

G.M. = $\sqrt[n]{x_1 \times x_2 \times x_3}$ = $\sqrt[3]{2 \times 4 \times 8}$ = $\sqrt[3]{4^3} = 4$

$\therefore$ A.M. = 4.67, G.M. = 4

G.M. is Less than A.M.

102. Features of an ideal measure of dispersion.

(i) If should be simple to understand and calculate.

(ii) It should be based on all items of observation.

103. The objectives of dispersion is :

(i) To study the reliability of a measure of central tendency.

(ii) To compare the variability of two or more series.

104. Measures of dispersion are mainly of two types

(i) Absolute measure and

(ii) Relative measure

Again they can also be classified as :

(i) Positional measure

(ii) Algebraic measure

(iii) Graphic measure

105. The limitations of range are :

(i) It is very much affected by extreme values.

(ii) It is not based on all the observations of the series but only on the extreme values.

106. Name of absolute measures of dispersion are

(i) Range

(ii) Quartile deviation

(iii) Mean Deviation

(iv) Standard Deviation

107. The merits of quartile deviation are :

(i) It is easy to understand and simple to calculate

(ii) It is useful in studying in open ended series.

(iii) It is useful in studying in open ended series.

108. The following steps are necessary for calculation of M.D.

(i) Calculate the value of average. ($\bar{x}$ or Med. or Mode)

(ii) Take deviations of each observations from the average ignoring '+' and '-' signs.

(iii) Obtain the total of the deviations.

(v) Divide the total by number of observations.

109. The merit of M.D. are :

(i) It is rigidly defined.

(ii) It is based on all values.

(iii) It is simple to understand and calculate.

110. The demerits of M.D. are :

(i) Its calculation in difficult when the average used is in fraction.

(ii) It ignores the algebraic signs (+, -) of deviations.
So it is not capable of further mathematical treatment.

111. The advantages of S.D. are :

(i) It is rigidly defined.

(ii) It is based on all the values of the observation.

(iii) It is capable of further algebraic treatment.

112. Standard deviation is considered as the best among all the measures of dispersion because it satisfy almost all the criterias of an ideal measure. It is rigidly defined, takes into account all the values and has further mathematical and statistical uses.

113. In normal distribution $\bar{x} \pm 3\sigma$ covers almost all the items of distribution.

Hence the highest value = 30 + 3 X 5 = 45

the lowest value = 30 - 3 x 5 = 15

114. Standard deviation is independent of charge in origin means if values in the distribution are added or subtracted by a constant the value of standard deviation remains uncharged.

115. The differences between M.D. and S.D. are :

M.D. can be found out from A.M. or Median or Mode but for calculation of S.D. on A.M. is used.

For calculation M.D. plus and minus signs are ignored where as in case of S.D. that is not so.

116. For finding out which batsman is more consistent. We have to compare their C.V.

Virat C.V. = $\frac{\sigma}{x} \times 100 = \frac{5}{52} \times 100 = 9.62$

Rohit = $\frac{7}{58}$ x $100 = 12.70$

C.V. of Virat is less, hence he is more consistent or in table.

GROUP - C

Long Answer Type Questions

Unit-I : Matrix

1. Find the inverse of the following matrix

$$A = \begin{pmatrix} 3 & 5 \\ 4 & 9 \end{pmatrix}$$

2. Using matrix algebra solves the following simultaneous equations.

$$4x + 3y = 8$$
$$6x + 7y = 17$$

3. A manufacturer produces 3 products A, B and C and sells them in two markets. Annual sales are indicated below.

Market	Products		
	A	B	C
I	10,000	2,000	18,000
II	6,000	20,000	8,000

If unit sales prices of A, B and C are respectively `2.50, ` 1.25 and ` 1.50 find the total revenue in each market.

4. Find M if $Mx\begin{pmatrix} 3 & 6 \\ -2 & -8 \end{pmatrix} = (-2,16)$

5. If $A = \begin{pmatrix} 0 & 2 & 3 \\ 2 & 1 & 4 \end{pmatrix}$ $B = \begin{pmatrix} 7 & 6 & 2 \\ 5 & 6 & 1 \end{pmatrix}$

Prove that 2A + 2 B = 2 (A+B)

6. Solve using matrix method

$x+y+z=6$ (i)
$2x-y+z=3$ (ii)
$2x+y-z=1$ (iii)

Determinant

7. Applying property of determinant prove that

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$$

8. Solve the following system of equations using Crammers' rule.

x + 2y + 3z = 6

x – 3y + 4z = 2

x – 4y +3z = 0

9. Evaluate by using the properties of determinant

$$\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

10. Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-b)$$

11. Solve by using Crammers Rule

3x – y = 2

x + 4y = 5

Set Theory

12. Prove that

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

13. Prove that

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

14. The population of a town is 6000. Out of which 3400 people read Sambad and 2700 people read Samaj. There are 700 people who read both the papers. Find the number of persons who do not read either of the two papers.

15. A market research group conducted a survey of 1000 consumers and reported that 730 consumers like products A and 455 consumers like product B. Find the least number those must have liked both products assuming that there may be consumers of products different from A and B.

16. Prove that

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

Function

17. Find inverse of the following functions.

(i) $f(x) = \dfrac{x-1}{x-2}$

(ii) $f(x) = \dfrac{2x-1}{x-1},\ x \neq 1$

18. What is functions ? Describe different types of function.

19. If $f(x) = \dfrac{2x+1}{3x-2}$ and $g(x) = \dfrac{4x+5}{3x-4}$ Find Fog.

20. Find the inverse of

$f(x) = \sqrt{9-x^2},\ -3 \leq x \leq 0$

21. The salary of an employee in 2015 was `1200 in 2017 it will be `1350. Express salary 'S' as a linear function of time.

Unit-II

22. Find the value of $\lim\limits_{x \to a} \dfrac{x^5 - a^5}{x^2 - a^2}$

23. Find the value of $\lim\limits_{x \to 5} \dfrac{x^2 - 9x + 20}{x^2 - 6x + 5}$

24. Find the value of $\lim\limits_{x \to 0} \dfrac{\sqrt{3+x}\sqrt{3-x}}{x}$

25. Evaluate $\lim\limits_{x \to \infty} \dfrac{5x^2 + 4x + 6}{6x^2 + 6x + 7}$

26. Evaluate $\lim\limits_{x \to 10} \dfrac{6^x - 3^x - 2^x + 1}{x^2}$

27. Show that f(x)=5x+3 is continuous at x=1.

28. Show that $f(x) = x^2 + 3x - 5$ is continuous at x=2.

29. Evaluate $\lim\limits_{x \to 2} \left[\dfrac{1}{x-2} - \dfrac{2(2x-3)}{x^3 - 3x^2 + 2x} \right]$

Differentiation

30. Find the differential Co-efficient of

$2x^3 + 3x^2 + 6x + 4.$

31. Find the differential Co-efficient of

$(x^2 - 2)(x^3 + 7)$

32. Differentiate $y = \dfrac{x^3}{x^3 + 2}$

33. Differentiate $y = (3 + 2x^2)^5$

34. Differentiate $y = (x^2 + 5)^{\frac{3}{2}}$

35. Differentiate $x^2 + xy^2 - y = 5$

36. Differentiate $x^2 - y^2 + 3x = 4y$

37. Differentiate $y = \dfrac{x^{\frac{1}{2}} + 2}{x^{\frac{1}{2}}}$

Integration

38. Integrate w.r.t. x.

    $x^3 + 5x^2 - 6x - 8$.

39. Evaluate $\int \dfrac{x^3 + x^2 - 1}{x^2} dx$

40. Evaluate $\int (x+1)^3 dx$

41. Evaluate $\int \dfrac{1}{2x-3} dx$

42. Evaluate $\int \dfrac{1}{5x+6} dx$

43. Evaluate $\int (1-2x)(1+3x)\, dx$

44. Evaluate $\int \left(x^{\frac{3}{2}} - \dfrac{1}{x^2} + \dfrac{5}{x} - 9 \right) dx$

45. Evaluate $\int \left(x + \dfrac{1}{x} \right)^2$

Unit-III

46. What is a measure of central tendency ? Explain the features of an ideal measures of central tendency.

47. What is an average? Briefly explain different types of averages.

48. Write notes on the following

    (i) Harmonic mean

    (ii) Weighted arithmetic mean

49. Explain the merits and demerits of A.M.

50. What is median ? Explain its merits and demerits.

51. What is mode ? Explain its merits and demerits.

52. Write notes on the followings

    (i) Geometric mean

    (ii) Relationship between mean median and mode.

(Practical Problems)

53. Calculate the average mark in Business mathematics scored by commerce student in a class from the following data

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of Students	2	3	11	20	32	25	7

54. The mean wage of 100 workers in a factory, running two shifts of 60 and 40 workers respectively in 238. The mean wage of 60 workers in the morning shift in `40. Find the mean wage of 40 workers working in the evening shift.

55. Find the average rate of increase in population which in the 1st decade has increased by 10% in the second decade by 20% and in the 3rd decade by 30%.

56. A motor car covered a distance of 100 kms. four times. The first time in at 50 kmph. The second time 20 kmph, the third time 40 kmph and the 4th time 60

kmph. Calculate average speed using appropriate average.

57. Calculate median for the following distribution

10-20	20-30	30-40	40-50	50-60
3	5	8	3	1

58. Calculate median from the following data.

Less than	10	20	30	40	50	60	70	80
Frequency	5	15	25	40	60	78	92	100

59. Calculate mode from the following data

Value	0-2	2-4	4-6	6-8	8-10	10-12
Frequency	5	7	16	20	16	9

60. Calculate the value of Q_3 from the following data

Wages	0-10	10-20	20-30	30-40	40-50
No. of Workers	22	38	46	35	19

61. The mean of 5 observations in 7. Later on it is found that two observations 4 and 8 were wrongly taken as 5 and 9. Find the correct mean.

Unit-IV

62. What do you mean by dispersion ? Explain the objectives of dispersion.

63. What is standard deviation? Discuss its merits and demerits.

64. Define dispersion and explain the features of an ideal measure of dispersion.

65. Distinguish between mean deviation and standard deviation. Which is considered better and why ?

66. Write notes on

    (i) Co-efficient of variation

    (ii) Inter Quartile Range

67. What is quartile deviation ? Explain its merits and limitations.

(Practical problems)

68. From the following data calculate mean deviation from mean.

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	6	28	51	11	4

69. Calculate Standard deviation from the following data

70. Calculate mean deviation from median from the following data

5	10	15	20	25
5	8	15	16	6

71. Find the S.D. from the following record of number of car accidents in a street.

No. of accidents	1	2	4	5	6
No. of days	2	3	3	1	1

72. For a distribution the co-efficient of variation in 22.5% and the value of the A.M. in 7.5. Find the value of standard deviation.

73. Determine Quartile deviation and co-efficient of Quartile deviation from the following data

X	30-35	35-40	40-45	45-50	50-55
F	5	11	26	10	8

74. An analysis of monthly wages paid to workers in firm A and B belonging to same industry gives the following results

	Firm A	Firm B
No. of workers	500	600
Avg. monthly wage	`186	`175
Variance of wage distribution	81	100

In which firm there is greater variability in individual wages.

75. From the following information find the mean and standard deviation.

$\sum(x-5)=8$

$\sum(x-5)^2=40$

$N=20$

Answer Keys

1. $(A) = \begin{pmatrix} 3 & 5 \\ 4 & 9 \end{pmatrix} \quad |A| = 27 - 20 = 7$

Inverse of A exists as $|A| \neq 0$

$C_{11} = +9 \quad C_{12} = -4 \quad C_{21} = -5 \quad C_{22} = 3$

The Co-factor matrix is

$$\begin{pmatrix} 9 & -4 \\ -5 & 3 \end{pmatrix}$$

Adjoint A = Transpose of Co-factor matrix.

Adjoint $A = \begin{pmatrix} 9 & -5 \\ -4 & 3 \end{pmatrix} \quad A^{-1} = \dfrac{\text{Adj } A}{|A|} = \begin{pmatrix} \frac{9}{7} & \frac{-5}{7} \\ \frac{-4}{7} & \frac{3}{7} \end{pmatrix}$

2. $4x + 3y = 8$

$6x + 7y = 17$

$$\begin{pmatrix} 4 & 3 \\ 6 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 17 \end{pmatrix}$$

$\therefore \quad AX = B$

$X = A^{-1}B$

We have to find out A^{-1}

$|A| = 28 - 18 = 10 \neq 0$

Now $C_{11} = +7 \;\; C_{12} = -6 \;\; C_{21} = -3 \;\; C_{22} = 4$

The Co-factor Matrix is $\begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} 7 & -6 \\ -3 & 4 \end{pmatrix}$

Adj. of A = Transpose of Co-factor Matrix.

$\therefore$ A adj. $= \begin{pmatrix} 7 & -3 \\ -6 & 4 \end{pmatrix}$

A inverse $= A^{-1} \dfrac{\text{A adj.}}{|A|} = \begin{pmatrix} 7/10 & -3/10 \\ -6/10 & 4/10 \end{pmatrix}$

$X \quad = A^{-1}B$

$$= \begin{pmatrix} 7/10 & -3/10 \\ -6/10 & 4/10 \end{pmatrix}\begin{pmatrix} 8 \\ 17 \end{pmatrix} = \begin{pmatrix} \frac{7}{10}x8 & -\frac{3}{10}x17 \\ \frac{-6}{10}x8 & +\frac{4}{10}x17 \end{pmatrix}$$

$$= \begin{pmatrix} \frac{56}{10} & -\frac{51}{10} \\ -\frac{48}{10} & +\frac{68}{10} \end{pmatrix} = \begin{pmatrix} \frac{5}{10} \\ 2 \end{pmatrix} \therefore \begin{matrix} x = \frac{5}{10} = .5 \\ y = 2 \end{matrix}$$

3. The revenue from each market is given by the product matrix

$$\begin{pmatrix} 2.50 & 1.25 & 1.50 \end{pmatrix} x \begin{pmatrix} 10,000 & 6,000 \\ 2,000 & 20,000 \\ 18,000 & 8,000 \end{pmatrix}$$

(2.5 x 10000)+(1.25 x 2000)+(1.5 x 18,000), (2.5 x 6000) + (1.25 x 20000) + (1.5 x 8000)

(25,000 + 2,500 + 27,000), (15,000 + 25,000 + 12,000)

(54,500, 52,000)

Revenue from market I – ` 54,500

II – ` 52,000

4. Since order of the resultant matrix is (1 x 2) and order of the second matrix is 2 x 2, the order of matrix M will be (1 x 2).

Let M be (x, y)

$$\therefore (x, y)\begin{pmatrix} 3 & 6 \\ -28 & -8 \end{pmatrix} = \{(3x - 2y) \quad (6x - 8y)\} = (-2 \quad 16)$$

$\therefore \quad 3x - 2y = -2$ (i)

$6x - 8y = 16$ (ii)

$$\begin{array}{r} 6/x - 4y = -4 \\ 6/x - 8y = 16 \\ \hline 4y = -20 \end{array}$$

$\therefore \quad y = -5$

$\therefore \quad x = -4$

$\therefore$ Matrix M is = (-4 -5)

5. $2A = \begin{pmatrix} 0 & 4 & 6 \\ 4 & 2 & 8 \end{pmatrix} \quad 2B = \begin{pmatrix} 14 & 12 & 4 \\ 10 & 12 & 2 \end{pmatrix}$

$$2A + 2B = \begin{pmatrix} 14 & 16 & 10 \\ 14 & 14 & 10 \end{pmatrix} \quad A + B = \begin{pmatrix} 7 & 8 & 5 \\ 7 & 7 & 5 \end{pmatrix} \quad 2(A + B) = \begin{pmatrix} 14 & 16 & 10 \\ 14 & 14 & 10 \end{pmatrix}$$

$\therefore 2A + 2B = 2(A + B)$

6. $A=\begin{pmatrix}1 & 1 & 1\\ 2 & -1 & 1\\ 2 & 1 & -1\end{pmatrix}\times\begin{pmatrix}x\\ y\\ z\end{pmatrix}=B=\begin{pmatrix}6\\ 3\\ 1\end{pmatrix}$

$X=A^{-1}B$

$|A|=1\begin{vmatrix}-1 & 1\\ 1 & -1\end{vmatrix}-1\begin{vmatrix}2 & 1\\ 2 & -1\end{vmatrix}+1\begin{vmatrix}2 & -1\\ 2 & 1\end{vmatrix}$

$=1.0+4+4=8\neq 0$

$C_{11}=\begin{vmatrix}-1 & 1\\ 1 & -1\end{vmatrix}=0\ C_{12}=-\begin{vmatrix}2 & 1\\ 2 & -1\end{vmatrix}=4\ C_{13}=\begin{vmatrix}2 & -1\\ 2 & 1\end{vmatrix}=4$

$C_{21}=-\begin{vmatrix}1 & 1\\ 1 & -1\end{vmatrix}=2\ \ C_{22}=\begin{vmatrix}1 & 1\\ 2 & -1\end{vmatrix}=-3\ \ C_{23}=-\begin{vmatrix}1 & 1\\ 2 & 1\end{vmatrix}=1$

$C_{31}=\begin{vmatrix}1 & 1\\ -1 & 1\end{vmatrix}=2\ \ C_{32}=-\begin{vmatrix}1 & 1\\ 2 & 1\end{vmatrix}=1\ \ C_{33}=\begin{vmatrix}1 & 1\\ 2 & -1\end{vmatrix}=-3$

The Cofactor matrix is

$\begin{pmatrix}0 & 4 & 4\\ 2 & -3 & 1\\ 2 & 1 & -3\end{pmatrix}$

The Adjoint matrix $\begin{pmatrix}0 & 2 & 2\\ 4 & -3 & 1\\ 4 & 1 & -3\end{pmatrix}$

$A=\frac{Aadj}{|A|}=\begin{pmatrix}\frac{0}{8} & \frac{2}{8} & \frac{2}{8}\\ \frac{4}{8} & \frac{-3}{8} & \frac{1}{8}\\ \frac{4}{8} & \frac{1}{8} & \frac{-3}{8}\end{pmatrix}$

$X=A^{-1}.B.=\begin{pmatrix}0/8 & 2/8 & 2/8\\ 4/8 & -3/8 & 1/8\\ 4/8 & 3/8 & -3/8\end{pmatrix}\begin{pmatrix}6\\ 3\\ 1\end{pmatrix}$

$=\begin{pmatrix}(0\times 6)+\left(\frac{2}{8}\times 3\right)+\left(\frac{2}{8}\times 1\right)\\ \left(\frac{4}{8}\times 6\right)+\left(\frac{-3}{8}\right)\times 3\left(\frac{1}{8}\times 1\right)\\ \left(\frac{4}{8}\times 6\right)+\left(\frac{1}{8}\times 3\right)-\left(\frac{3}{8}\times 1\right)\end{pmatrix}=\begin{pmatrix}0+\frac{6}{8}+\frac{2}{8}\\ 3-\frac{9}{8}+\frac{1}{8}\\ 3+\frac{3}{8}-\frac{3}{8}\end{pmatrix}=\begin{pmatrix}1\\ 2\\ 3\end{pmatrix}\therefore\begin{pmatrix}x\\ y\\ z\end{pmatrix}=\begin{pmatrix}1\\ 2\\ 3\end{pmatrix}\ \begin{matrix}x=1\\ y=2\\ z=3\end{matrix}$

7. $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$ Taking $C_2 \to C_2 + C_3$ we will get

$$\begin{vmatrix} 1 & a+b+c & b+c \\ 1 & a+b+c & c+a \\ 1 & a+b+c & a+b \end{vmatrix} \quad (a+b+c)\begin{vmatrix} 1 & 1 & b+c \\ 1 & 1 & c+a \\ 1 & 1 & a+b \end{vmatrix}$$

As 1st second col. Of the determinant are same the value of the determinant is 0.

Then we get $(a+b+c)0=0$

8. $x+2y+3z=6$

$x-3y+4z=2$

$x-4y+3z=0$

$$|D|\begin{vmatrix} 1 & 2 & 3 \\ 1 & -3 & 4 \\ 1 & -4 & 3 \end{vmatrix} = 1\begin{vmatrix} -3 & 4 \\ -4 & 3 \end{vmatrix} - 2\begin{vmatrix} 1 & 4 \\ 1 & 3 \end{vmatrix} + 3\begin{vmatrix} 1 & -3 \\ 1 & -4 \end{vmatrix}$$
$$= 1(-9+16) - 2(3-4) + 3(-4+3)$$
$$= 7+2-63 = 6$$

$$D_1\begin{vmatrix} 6 & 2 & 3 \\ 2 & -3 & 4 \\ 0 & -4 & 3 \end{vmatrix} = 6\begin{vmatrix} -3 & 4 \\ -4 & 3 \end{vmatrix} - 2\begin{vmatrix} 2 & 4 \\ 0 & 3 \end{vmatrix} + 3\begin{vmatrix} 2 & -3 \\ 0 & -4 \end{vmatrix}$$
$$= 6(-9+16) - 2(6-0) + 3(-8-0)$$
$$= 42-12-24 = 6$$

$$D_2\begin{vmatrix} 1 & 6 & 3 \\ 1 & 2 & 4 \\ 1 & 0 & 3 \end{vmatrix} = 1\begin{vmatrix} 2 & 4 \\ 0 & 3 \end{vmatrix} - 6\begin{vmatrix} 14 \\ 13 \end{vmatrix} + 3\begin{vmatrix} 1 & 2 \\ 1 & 0 \end{vmatrix}$$
$$= 1(6-0) - 6(3-4) + 3(0-2)$$
$$= 6+6-6 = 6$$

$$D_3\begin{vmatrix} 1 & 2 & 6 \\ 1 & -3 & 2 \\ 1 & -4 & 0 \end{vmatrix} = 1\begin{vmatrix} -3 & 2 \\ -4 & 0 \end{vmatrix} - 2\begin{vmatrix} 1 & 2 \\ 1 & 0 \end{vmatrix} + 6\begin{vmatrix} 1 & -3 \\ 1 & -4 \end{vmatrix}$$
$$= 1(0+8) + 4 + 6(-4+3)$$
$$= 8+4-6 = 6$$

$x = \frac{D_1}{D} = \frac{6}{6} = 1$ $\quad y = \frac{D_2}{D} = \frac{6}{6} = 1$ $\quad z = \frac{D_3}{D} = \frac{6}{6} = 1$

$\therefore x = y = z = 1$

9. $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$ Applying $R_1 \to R_1 + R_2 + R_3$

$$\begin{vmatrix} 0 & 0 & 0 \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = 0$$

10. $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ Applying $C_1 \to C_1 - C_2$ and $C_2 \to C_2 - C_3$

$$= \begin{vmatrix} 0 & 0 & 1 \\ a-b & b-c & c \\ a^2-b^2 & b^2-c^2 & c^2 \end{vmatrix} = (a-b)(b-c)\begin{vmatrix} 0 & 0 & 1 \\ 1 & 1 & c \\ a+b & b+c & c^2 \end{vmatrix}$$

Expanding the determinant by 1st row.

$$A = (1-b)(b-c)\begin{vmatrix} 1 & 1 \\ a+b & b+c \end{vmatrix} = (a-b)(b-c)(b+c-a-b) = (a-b)(b-c)(c-a)$$

11. $3x - y = 2$

$x + 4y = 5$

$$D = \begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix} = 12 + 1 = 13$$

$$D_1 = \begin{vmatrix} 2 & -1 \\ 5 & 4 \end{vmatrix} = 8 + 5 = 13$$

$$D_2 = \begin{vmatrix} 3 & 2 \\ 1 & 5 \end{vmatrix} = 15 - 2 = 13$$

$$x = \frac{D_1}{D} = \frac{13}{13} = 1$$

$$y = \frac{D_2}{D} = \frac{13}{13} = 1$$

12. Let $A = \{a,b,c,d\}$ $E = \{a,b,c,d,e,f,g\}$

$B = \{b,c,d,e\}$ $(A \cap B) = \{a,b,c,d\}$

$c = \{c,d,e,f\}$

LHS= $(A \cap B)' = E - (A \cap B) = \{a,e,f,g\}$

RHS $= A^1 \cup B^1 = (E-A) \cup (E-B) = \{e,f,g\} \cup \{a,f,g\} = \{a,e,f,g\}$

LHS=RHS (Proved)

13. Let $A=\{a,b,c,d\}\quad B=\{c,d,e,f\}\quad C=\{c,d,e,f\}$

$(B\cup C)=\{b,c,d,e,f\}\ \ (A-B)=\{a\}\ \ (A-C)=\{a,b\}$

LHS. $A-(B\cup C)=\{a\}$

RHS $(A-B)\cap(A-C)=\{a\}$

LHS = RHS proved.

14. Let E be the population.

'A' people who read Sambad

'B' people who read Samaj

$\therefore(E)=6000,\quad n(A)=3400\quad n(B)=2700$

$$n(A\cap B)=700$$

$$n(A\cup B)=n(A)+(B)-n(A\cap B)=3400+2700-700=5400$$

Thus the number of people who neither read Sambad or Samaj in the four = $n(A\cap B)$

$$=n(E)-n(A\cup B)=6000-5400=600$$

15. Let the consumers like product A. be set A

Let the consumers like product B be set B

$$\therefore n(A)=730\quad n(B)=455$$

We have to find out the number of consumers who like both i.e. $n(A\cap B)$

$$n(A\cup B)=1000$$
$$1000=n(A)+n(B)-n(A\cap B)=730+455-n(A\cap B)$$
$$n(A\cap B)=730+455-1000\ \ =1185-1000=185$$

16. Let $A=\{a,b,c,d\}\ \ B=\{b,c,d,e\}\ \ C=\{c,d,e,f\}$

LHS. $(A\cap B)\cup C=\big[\{a,b,c,d\}\cup\{b,c,d,e\}\big]\cup=\{c,d,e,f\}$

$=[a,b,c,d,e]\cup\{c,d,e,f\}=\{a,b,c,d,e,f\}$

RHS. $A\cup(B\cup C)=\{a,b,c,d\}\cup\big[\{b,c,d,e\}\cup\{c,d,e,f\}\big]$

$=\{a,b,c,d\}\cup\{b,c,d,e,f\}=\{a,b,c,d,e,f\}$

LHS = RHS

17. (i) $y=\dfrac{x-1}{x-2}$

$$\Rightarrow xy-2y=x-1\Rightarrow xy-x=2y-1\Rightarrow x(y-1)=2y-1\Rightarrow x=\frac{2y-1}{y-1}$$

(ii) $y=\dfrac{2x-1}{x-1}$

$\Rightarrow yx-y=2x-1 \Rightarrow yx-2x-y-1$

$\Rightarrow x(y-2)=y-1 \Rightarrow x=\dfrac{y-1}{y-2}$

18. A function f from set A to set B is a specific type of relation for which every element x of set A has one and only one image in set B. It is written as

$f: A \to B$ where $f(x)=y$

Type of function to be discussed in detail.

19. $fog=f\left(g\left(x\right)\right)=\dfrac{4x+5}{3x-4}$

$$\frac{2\left(\frac{4x+5}{3x-4}\right)+1}{3\left(\frac{4x+5}{3x-4}\right)-2}=\frac{\frac{2(4x+5)+(3x-4)}{3x-4}}{\frac{3(4x+5)-2(3x-4)}{3x-4}}=\frac{8x+10+3x-4}{12x+15-6x+8}=\frac{11x+6}{5x+23}.$$

20. $y=\sqrt{9-x^2}$ $\quad y^2=9-x^2$ $\quad x^2=9-y^2$ $\quad x=\pm\sqrt{9-y^2}$

Since the value of x varies between -3 to 0

we have $x=-\sqrt{9-x^2}$ $\quad f^{-1}=-\sqrt{9-x^2}$

21. Let the linear relationship be $S=at+b$

Taking 2015 as base year we get

$S=1200$ when $t=0$

$\therefore 1200=at+b=a\times 0+b$

$\therefore b=1200$

Again $S=1350$ when $t=2017-2015=2$

$\therefore 1350=a\times 2+1200$

$\therefore 2a=150 \quad a=75$

$\therefore$ Thus the required linear relationship is $S=75t+1200$

Unit-II

22. $$\lim_{x\to a}\frac{x^5-a^5}{x^2-a^2}=\frac{\lim\limits_{x\to a}\frac{x^5-a^5}{x-a}}{\lim\limits_{x\to a}\frac{x^2-a^2}{x-a}}=\frac{5a^4}{2a}\left(\because \lim_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}\right)=\frac{5}{2}a^3$$

23. $$\lim_{x\to 5}\frac{x^2-9x+20}{x^2-6x+5}=\lim_{x\to 5}\frac{x^2-5x-4x+20}{x^2-5x-x+5}=\lim_{x\to 5}\frac{x(x-5)-4(x-5)}{x(x-5)-1(x-5)}$$

$$=\lim_{x\to 5}\frac{(x-5)(x-4)}{(x-5)(x-1)} \quad =\lim_{x\to 5}\frac{x-4}{x-1}=\frac{5-4}{5-1}=\frac{1}{4}$$

24. $\underset{x\to 0}{Lim}\dfrac{\sqrt{3+x}-\sqrt{3-x}}{x}$

$\Rightarrow \underset{x\to 0}{Lim}\dfrac{\sqrt{3+x}\sqrt{3-x}}{x}\times\dfrac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}+\sqrt{3-x}}$

$\Rightarrow \underset{x\to 0}{Lim}\dfrac{(3+x)-(3-x)}{x\left(\sqrt{3+x}+\sqrt{3-x}\right)}$

$\Rightarrow \underset{x\to 0}{Lim}\dfrac{2x}{x\left(\sqrt{3+x}+\sqrt{3-x}\right)}$

$\Rightarrow \underset{x\to 0}{Lim}\dfrac{2}{\sqrt{3+x}+\sqrt{3-x}}$

$\Rightarrow \underset{x\to 0}{Lim}\dfrac{2}{\sqrt{3+0}+\sqrt{3-x}}=\dfrac{2}{\sqrt{3}+\sqrt{3}}$

$\Rightarrow \dfrac{2}{2\sqrt{3}}=\dfrac{1}{\sqrt{3}}$.

25. $\underset{x\to\infty}{Lim}\dfrac{5x^2+4x+6}{6x^2+6x+7}$

$\Rightarrow \underset{x\to\infty}{Lim}\dfrac{\frac{5x^2}{x^2}+\frac{6x}{x^2}+\frac{6}{x^2}}{\frac{6x^2}{x^2}+\frac{6x}{x^2}+\frac{7}{x^2}}=\dfrac{5+\frac{4}{x}+\frac{6}{x^2}}{6+\frac{6}{x}+\frac{7}{x^2}}$

$\Rightarrow Let\ \dfrac{1}{x}=y$ and as $x\to\infty\ \ y\to 0$

$\Rightarrow \underset{y\to 0}{Lim}\dfrac{5+4y+6y^2}{6+6y+7y^2}=\underset{y\to 0}{Lim}\dfrac{5+4y+6y^2}{6+6y+7y^2}$

$\Rightarrow \dfrac{5+4.0+6.0}{6+6.0+7.0}=\dfrac{5+0+0}{6+0+0}=\dfrac{5}{6}$

26. $\underset{x\to 0}{Lim}\dfrac{6^x-3^x-2^x+1}{x^2}$

$=\underset{x\to 0}{Lim}\dfrac{2^x\times 3^x-3^x-2^x+1}{x^2}=\dfrac{3^x\left(2^x-1\right)-1\left(2^x-1\right)}{x^2}$

$=\underset{x\to 0}{Lim}\dfrac{\left(2^x-1\right)\left(3^x-1\right)}{x^2}=\underset{x\to 0}{Lim}\dfrac{2^x-1}{x}\times\underset{x\to 0}{Lim}\dfrac{3^x-1}{x}$

$=Log_e{}^2\times Log_e{}^3 \qquad \left(\because \underset{x\to 0}{Lim}\dfrac{a^x-1}{x}=Log_e{}^a\right.$

27. $f(x)=5x+3$

$f(1)=5.1+3=8$

Now $\underset{x\to1^+}{Lim}=\underset{h\to0}{Lim}\quad f(1+h)=\underset{h\to0}{Lim}\ 5(1+h)+3=5(1+0)+3=8$

Now $\underset{x\to1^-}{Lim}=\underset{h\to0}{Lim}\ f(1-h)=\underset{h\to0}{Lim}\ 5(1-h)+3=5(1-0)+3=8$

Since $\underset{x\to1^+}{Lim}=\underset{x\to1^-}{Lim}=f(1)$ the function is continuous at the point $x=1$

28. $f(x)=x^2+3x+5$

$f(2)=2^2+3\times2+5=4+6+5=15$

$\underset{x\to2^-}{Lim}\,x^2+3x+5\ =\underset{h\to0}{Lim}\,f(2-h)=\underset{h\to0}{Lim}(2-h)^2+3(2-h)+5$

$=\underset{h\to0}{Lim}(2-0)^2+3(2-0)+5=(2+0)^2+3(2+0)+5\ =4+6+5=15$

$\underset{x\to2^+}{\mathrm{Lim}}\,x^2+3x+5=\underset{h\to0}{\mathrm{Lim}}\,f(2+h)=\underset{h\to0}{\mathrm{Lim}}(2+h)^2+3(2+h)+5$

$=(2+0)^2+3(2+0)+5\ =4+6+5=15$

Since $\underset{x\to2^-}{Lim}\,f(x)=\underset{x\to2^+}{Lim}\,f(x)=f(x)$ function is continuous at $x=2$

29. $\underset{x\to2}{Lim}\left[\frac{1}{x-2}-\frac{2(2x-3)}{x^3-3x^2+2x}\right]=\underset{x\to2}{Lim}\left[\frac{1}{x-2}-\frac{2(2x-3)}{x^3-2x^2-x^2+2x}\right]$

$=\underset{x\to2}{Lim}\left[\frac{1}{x-2}-\frac{2(2x-3)}{x^2(x-2)-x(x-2)}\right]\ =\underset{x\to2}{Lim}\left[\frac{1}{x-2}-\frac{2(2x-3)}{(x-2)x(x-1)}\right]$

$=\underset{x\to2}{Lim}\left[\frac{x(x-1)-2(2x-3)}{x(x-1)(x-2)}\right]\ =\underset{x\to2}{Lim}\left[\frac{x^2-x-4x+6}{x(x-1)(x-2)}\right]$

$=\underset{x\to2}{Lim}\frac{x^2-5x+6}{x(x-1)(x-2)}\qquad=\underset{x\to2}{Lim}\left[\frac{x^2-2x-3x+6}{x(x-1)(x-2)}\right]$

$=\underset{x\to2}{Lim}\left[\frac{x(x-2)-3(x-2)}{x(x-1)(x-2)}\right]=\underset{x\to2}{Lim}\left[\frac{(x-3)(x-2)}{x(x-1)(x-2)}\right]$

$=\underset{x\to2}{Lim}\frac{x-3}{x(x-1)}=\frac{2-3}{2(z-1)}=\frac{-1}{2}=\frac{1}{2}$

30. $y = 2x^3 + 3x^2 + 6x + 4$

$$\frac{dy}{dx} = \frac{d}{dx}\left(2x^3 + 3x^2 + 6x + 4\right) = \frac{d}{dx}\left(2x^3\right) + \frac{d}{dx}\left(3x^2\right) + \frac{d}{dx}(6x) + \frac{d}{dx}4$$

$$= 6x^2 + 6x + 6x^0 + 0 = 6x^2 + 6x + 6 = 6\left(x^2 + x + 1\right)$$

31. $Y = \left(x^2 - 2\right)\left(x^3 + 7\right)$

$$\frac{dy}{dx} = \left(x^3 + 7\right)\frac{d}{dx}\left(x^2 - 1\right) + \left(x^2 - 2\right)\frac{d}{dx}\left(x^3 + 7\right)$$

$$= \left(x^3 + 7\right)2x + \left(x^2 - 2\right)3x^2 = 2x^4 + 14x + 3x^4 - 6x^2 = 5x^4 - 6x^2 + 14x$$

32. $y = \dfrac{x^3}{x^3 + 2}$

$$\frac{dy}{dx} = \frac{\left(x^3 + 2\right)\frac{d}{dx}x^3 - x^3\frac{d}{dx}\left(x^3 + 2\right)}{\left(x^3 + 2\right)^2}$$

$$= \frac{\left(x^3 + 2\right)3x^2 - x^3\left(3x^2\right)}{\left(x^3 + 2\right)^2} = \frac{3x^5 + 6x^2 - 3x^5}{\left(x^3 + 2\right)^2} = \frac{6x^2}{\left(x^3 + 2\right)^2}$$

33. $y = \left(3 + 2x^2\right)^5$

Let $\left(3 + 2x^2\right) = u$ *then* $y = u^5$

$$\frac{du}{dx} = \frac{d}{dx}\left(3 + 2x^2\right) = 4x$$

$$\frac{dy}{du} = \frac{d}{du}u^5 = 5u^4 = 5\left(3 + 2x^2\right)^4$$

By chain rule $\dfrac{dy}{dx} = \dfrac{du}{dx} \times \dfrac{dy}{du}$

$$= 4x\left[5\left(3 + 2x^2\right)^4\right] = 20x\left(3 + 2x^2\right)^4$$

34. $y = \left(x^2 + 5\right)^{\frac{3}{2}}$

Let $\left(x^2 + 5\right) = u$ *then* $y = u^{3/2}$

$$\frac{du}{dx} = \frac{d}{dx}\left(x^2 + 5\right) = 2x$$

$$\frac{dy}{du} = \frac{d}{du}u^{3/2} = 3/2\, u^{1/2} = 3/2\left(x^2 + 5\right)^{1/2}$$

By chain rule $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$$= 3/2\left(x^2+5\right)^{1/2}.2x = 3x\left(x^2+5\right)^{1/2}$$

35. Given $x^2 + xy^2 - y = 5$

Differentiating both the sides w.r.t

$$\frac{d}{dx}\left(x^2 + xy^2 - y\right) = \frac{d}{dx}(5)$$

$$= \frac{d}{dx}x^2 + \frac{d}{dx}\left(xy^2\right) - \frac{d}{dx}y^2 = 0$$

$$= 2x + y^2\frac{d}{dx}(x) + x\frac{d}{dx}y^2 - 1\frac{dy}{dx} = 0$$

$$= 2x + y^2 + 2yx\frac{dy}{dx}7\frac{dy}{dx} = 0$$

$$= 2yx\frac{dy}{dx} - 1\frac{dy}{dx} = 02x - y^2$$

$$= 1\frac{dy}{dx} - \frac{2yx}{dx} = 2x + y^2$$

$$= (1-2xy)\frac{dy}{dx} = 2x + y^2$$

$$= \frac{dy}{dx} = \frac{2x+y^2}{1-2xy}$$

36. $x^2 - y^2 + 3x = 4y$

Differentiating both the sides w.r.t x

$$= \frac{d}{dx}\left(x^2 - y^2 + 3x\right) = \frac{d}{dx}4y$$

$$= \frac{d}{dx}\left(x^2\right) - \frac{d}{dx}\left(y^2\right) + \frac{d}{dx}(3x) = 4\frac{dy}{dx}$$

$$= 2x - 2y\frac{dy}{dx} + 3 = 4\frac{dy}{dx}$$

$$= (2x+3) = \frac{dy}{dx}(4+2y) = \frac{dy}{dx} = \frac{2x+3}{2y+4}$$

37. $y = \dfrac{x^{1/2} + 2}{x^{1/2}}$

$$\frac{dy}{dx} = \frac{d}{dx}\left(\frac{x^{1/2} + 2}{x^{1/2}}\right)$$

$$= \frac{x^{\frac{1}{2}}\dfrac{d}{dx}\left(x^{\frac{1}{2}} + 2\right) - \left(x^{\frac{1}{2}} + 2\right)\dfrac{d}{dx}x^{\frac{1}{2}}}{\left(x^{\frac{1}{2}}\right)^2}$$

$$= \frac{x^{1/2}\left(\frac{1}{2}x^{-1/2}\right) - \left(x^{1/2} + 2\right)\left(\frac{1}{2}x^{-1/2}\right)}{x}$$

$$= \frac{\frac{1}{2} - \frac{1}{2} + x^{-1/2}}{x} = \frac{x^{-1/2}}{x} = x^{-1/2-1} = x^{-\frac{3}{2}}$$

Integration

38. $y = x^3 + 5x^2 - 6x - 8$

$$I = \int \left(x^3 + 5x^2 - 6x - 8\right)$$

$$= \int x^3 dx + \int 5x^2 dx - \int 6x\,dx - \int 8dx$$

$$= \frac{x^4}{4} + 5\int x^2 dx - 6\int x dx - 8\int dx$$

$$= \frac{x^4}{4} + 5\frac{x^3}{3} - 6\frac{x^2}{2} - 8x + C$$

$$= \frac{x^4}{4} + \frac{5x^3}{3} - 3x^2 - 8x + C$$

39. $I = \int \dfrac{x^3 + x^2 - 1}{x^2} = \int \dfrac{x^3}{x^2} + \dfrac{x^2}{x^2} - \dfrac{1}{x^2}\,dx = \int x + 1 - x^{-2}dx$

$$= \int x dx + \int 1dx - \int x^{-2}dx = \frac{x^2}{2} + 1\int dx - \frac{x^{-1}}{-1} + C = \frac{x^2}{2} + x + x^{-1} + C$$

40. $I = \int \left(x + 1\right)^3$

$$= \int \left(x^3 + 1 + 3x^2 + 3x\right) = \int x^3 dx + \int 1dx + \int 3x^2 dx + \int 3x dx$$

$$\frac{x^4}{4} + 1\int dx + 3\int x^2 dx + 3\int x\,dx = \frac{x^4}{4} + x + 3\frac{x^3}{3} + 3\frac{x^2}{2} + C$$

$$= \frac{x^4}{4} + x + x^3 + \frac{3x^2}{2} + C = \frac{x^4}{4} + x^3 + \frac{3x^2}{2} + x + C$$

41. $I = \int \frac{1}{2x-3} dx$

Let $2x-3=t$ then $\frac{dt}{dx} = \frac{d}{dx}(2x-3) = 2, 2dx = dt$

$$I = \tfrac{1}{2}\int \frac{2}{2x-3} dx = \tfrac{1}{2}\int \frac{2dx}{t} = \tfrac{1}{2}\int \frac{dt}{t}$$
$$= \tfrac{1}{2}\log t + C \ = \tfrac{1}{2}\log(2x-3) + C$$

42. $\int \frac{1}{5x+6} dx$

$I = \int \frac{1}{5x+6} dx$

Let $5x+6=t$ then $\frac{dt}{dx} = 5$, $5dx = dt, dx = \frac{dt}{5}$

$$I = \int \frac{1}{t}\frac{1}{5} dt = \tfrac{1}{5}\int \frac{dt}{t} \ = \frac{1}{5}\log t + C = \frac{1}{5}\log(5x+6) + C$$

43. $I = \int (1-2x)(1+3x) dx$

$$= \int (1+2x+3x-6x^2) dx = \int (1+x-6x^2) dx = \int 1dx + \int x\,dx - \int 6x^2\,dx$$
$$= 1\int dx + \frac{x^2}{2} - 6\int x^2 dx = x + \frac{x^2}{2} - 6\frac{x^3}{3} + C = x + \frac{x^2}{2} - 2x^3 + C$$

44. $I = \int \left(x^{3/2} - \frac{1}{x^2} + \frac{5}{x} - 9 \right) dx$

$$= \int \left(x^{3/2} - x^{-2} + \frac{5}{2} - 9 \right) dx$$
$$= \int x^{3/2} dx - \int x^{-2} dx + 5\int \frac{1}{x} dx - \int 9dx$$
$$= \frac{x^{\frac{3}{2}+1}}{\frac{3}{2}+1} - \frac{x^{-2+1}}{-2+1} + 5\log x - 9x + C$$
$$= \frac{2}{5}x^{5/2} + \frac{1}{x} + 5\log x - 9x + C$$

45. $I = \int \left(x + \frac{1}{x} \right)^2 dx$

$I = \int \left(x^2 + \frac{1}{x^2+2} \right) dx$

$$= \int (x^2) dx + \int \left(\frac{1}{x^2} \right) dx + \int 2dx \text{ b} = \frac{x^3}{3} + \int (x^{-2}) dx + 2x \ = \frac{x^3}{3} + \frac{x^{-2+1}}{-2+1} + 2x + C$$

$$\frac{x^3}{3}-\frac{1}{x}+2x+C$$

53. **M-A**

Marks	M.V	d	f	fd
30-39	34-5	-3	2	-6
40-49	44.5	-2	3	-6
50-59	54.5	-1	11	-11
60-69	64.5	0	20	0
70-79	74.5	1	32	32
80-89	84.5	2	25	50
90-99	94.5	3	7	21
			N-100	$\sum fd=80$

Assumed Mean (A)=64.5

C=10

Avg. Mark = $A+\frac{\sum fd}{N}\times C=64.5+\frac{80}{100}\times 10=64.5+8=72.5$

54. No of workers in morning shift $N_1=60$

No of workers in evening shift $N_2=40$

The combined mean $\overline{X}_{12}=38$

The mean wage of 60 workers $\overline{X}_1=40$

$$\overline{X}_{12}=\frac{\overline{X}_1N_1+\overline{X}_2N_2}{N_1+N_2}$$

$$38 \quad =\frac{40\times 60+\overline{X}_2\times 40}{60+40}=\frac{2400+40\overline{X}_2}{100}$$

$$40\overline{X}_2=3800-2400=1400$$

$$\overline{X}_2=\frac{1400}{40}=35$$

$\therefore$ The average wage of evening shift workers is Rs. 35.

55. The appropriate average here in G.M

	% rise	x	log
1st Decade	10	110	2.0414
2nd Decade	20	120	2.0792
3rd Decade	30	130	2.1139
			$\sum\overline{\log x}\,6.2345$

G.M=Antilog $\frac{\sum Logx}{N}$ = Antilog $\frac{6.2345}{3}$ = $Al2.0782$ =119.8

The average rate of increase is 119.8-100=19.8%

56. Here the appropriate average in harmonic mean.

$H.M = \frac{N}{\sum \frac{1}{x}}$ Here N=4

$$\frac{1}{\sum x} = \frac{1}{50} + \frac{1}{20} + \frac{1}{40} + \frac{1}{60} = \frac{12+30+15+10}{600} = \frac{67}{600}$$

$$H.M = \frac{4}{\frac{67}{600}} = \frac{4 \times 600}{67} = \frac{2400}{67} = 35.82$$

$\therefore$ The average speed of the motor car is 35. 82.

57.

	Frequency	Cumulative frequency
10-20	3	3
20-30	5	8
30-40	8	16
40-50	3	19
50-60	1	20

Median = size of $\frac{N}{2}$ th item $=$ size of $\frac{20}{2} = 10$ th item

This median lies in the group 30-40

Median $= L_1 + \frac{L_2 - L_1}{f_1}(m - c.f)$

Where $L_1 = 30$ $L_2 = 40$, $f_1 = 8$ $m. = 10$ $c.f = 8$

Median $= 30 + \frac{40-30}{8}(10-8) = 30 + \frac{10}{8} \times 2 = 30 + \frac{10}{4} = 30 + 2.5 = 32.5$

58.

	Frequency	C.F
0-10	5	5
10-20	10	15
20-30	10	25
30-40	15	40
40-50	20	60
50-60	18	78
60-70	14	92
70-80	8	100

Median = size of $\frac{N}{2}$ th item i.e $\frac{100}{2}=50$ th item.

$\therefore$ The median class is 40-50

Median $=L_1+\frac{L_2-L_1}{f_1}(m-c)$

Given $L_1-40, L_2=50,\ f_1=20, m=50, c=40$

Median $=40+\frac{50-40}{20}(50-40)$

$=40+\frac{10}{20}\times 10=40+5=45$

59.

	Frequency
0-2	5
2-4	7
4-6	16 (f_0)
6-8	20 (f_1)
8-10	16 (f_2)
10-12	9

As the highest frequency relates to the class 6-8, it is the model class.

Mode $=l_1+\frac{f_1-f_0}{2f_1-f_0-f_2}(l_2-l_1)$

$L_1=6=f_1=20\ \ f_2=16\ \ f_0=10\ l_2=8$

Mode $=6+\frac{20-16}{2\times 20-16-16}(8-6)=6+\frac{4}{40-32}\times 2=6+\frac{4}{8}\times 6+1=7$

60.

Wages	Frequency	C.F
0-10	22	22
10-20	38	60
20-30	46	106
30-40	35	141
40-50	19	160
	N=160	

$Q_3=$ size of $\frac{3N}{4}$ th item i.e $\frac{3\times 160}{4}=120$ th item

$\therefore Q_3$ lies in the class 30-40

$$Q_3 = l_1 + \frac{\frac{3N}{4} - c.f}{4} \times i$$

Where $l_1 = 30 \frac{3N}{4} = 120 cf = 106. f = 35\ i = 10$

$$Q_3 = 30 + \frac{120 - 160}{35} \times 10$$

$$= 30 + \frac{14}{35} \times 10 = 30 + \frac{140}{35} = 30 + 4 = 34$$

61. Given $N = 5.\ \overline{X} = 7$

$$\overline{X} = \frac{\sum X}{N} \qquad \sum X = \overline{X} N$$

$\therefore \sum X = 5 \times 7 = 35 (incorrect)$

Correct $\sum X = 35 +$ correct items- incorrect items

$= 35 + 5 + 9 - 4 - 8$

$= 37$

Correct $\overline{X} = \frac{\sum X}{N} = \frac{37}{5} = 7.4$

Unit Iv (Practical Problems)

68.

Marks	f	m.v	fm	$\lvert X - \overline{X} \rvert$	fd
0-10	6	5	30	17.9	107.4
10-20	28	15	420	7.9	221.2
20-30	51	25	1275	2.1	107.1
30-40	11	35	385	12.1	133.1
40-50	4	45	180	22.1	88.4
	$N = 100$		$\sum fm = 2290$	62.1	657.2

$$\overline{X} = \frac{\sum fm}{N} \frac{2290}{100} = 22.9$$

$$M.D = \frac{\sum f1d1}{N} = \frac{657.2}{100} = 6.572$$

69.

x	f	m.v	f.m	$X - \overline{X}$	d^2	fd^2
0-10	5	5	25	-20	450	2000
10-20	10	15	150	-10	100	1000
20-30	15	25	375	0	0	0
30-40	10	35	350	10	100	1000
40-50	5	45	225	20	400	2000
	N=45		$\sum fm = 1125$			$\sum fd^2 = 6000$

$$\overline{X} = \frac{\sum fm}{N} = \frac{1125}{45} = 25$$

$$S.D = \sqrt{\frac{\sum fd^2}{N}} = \sqrt{\frac{6000}{45}} = \sqrt{133.33} = 11.55$$

70.

x	f	c.f	$\lvert d \rvert$ $\lvert X - Md \rvert$	f $\lvert d \rvert$
5	5	5	10	50
10	8	13	5	40
15	15	28	0	0
20	16	44	5	80
25	6	50	10	60
				$\sum f \lvert d \rvert = 320$

Median = size of $\frac{N+1}{2} th$ item

= size of $\frac{50+1}{2} = 25.5$ th item

$\therefore$ median is 15

Mean Deviation $= \frac{\sum f \lvert d \rvert}{N} = \frac{230}{50} = 46$

71.

x	f	d $(x-4)$	f.d	d^2	fd^2
1	2	-3	-6	9	18
2	3	-2	-6	4	12
4	3	0	0	0	0
5	1	1	1	1	1
6	1	2	2	4	4
	N=10		$\sum fd = -9$		$\sum fd^2 = 35$

$$= \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$$

$$= \sqrt{\frac{35}{10} - \left(\frac{-9}{10}\right)^2}$$

$$= \sqrt{3.5 - 0.81}$$

$$= \sqrt{2.69}$$

$$= 1.64$$

72. $C.V = 22.5\%$ $\overline{X} = 7.5$

$$C.V = \frac{\sigma}{\overline{X}} \times 100$$

22.5= $C.V = \frac{\sigma}{7.5} \times 100$

$\sigma = \frac{22.5 \times 7.5}{100} = \frac{168.75}{100} = 1.69$

73.

x	f	c.f
30-35	5	5
35-40	11	16
40-45	26	42
45-50	10	52
50-55	8	60
	N=60	

$Q_1 =$ the value of $\frac{N}{4}$ th item = The value of $\frac{60}{4}$=15 th item 15 th item lies in class 35-39

$$Q_1 = L + \frac{\frac{N}{4} - c.f}{f} \times I$$

Where =35 $\frac{N}{4} = 15\ f = 11\ c.f = 5\ \ I = 5$

$$Q_1 = 35 + \frac{15-5}{11} \times 35 + \frac{50}{11} = 35 + 4.55 = 39.55$$

$Q_3 =$ The value of $\frac{3N}{4}$ th item. The value of $\frac{3 \times 60}{4} = 45th$ item.

$45th$ item lies in class 45-50

$$Q_3 = L + \frac{\frac{3N}{4} - cf}{f} \times i$$

$L = 45 \frac{3N}{4} = 45\ c.f = 42 \quad f = 10\ \ i = 5$

$$Q_3 = 45 + \frac{45-42}{10} \times 5$$

$$= 45 + \frac{3}{10} \times 5 = 45 + 1.5 = 46.5$$

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{46.5 - 39.55}{2} = 3.48$$

Coefficient of $Q.D = \frac{Q_3 - Q_1}{Q_3 + Q_1}$

$$= \frac{46.5 - 39.55}{46.5 + 39.55}$$

$$= \frac{6.95}{86.05}$$

$$= 0.081$$

74. To determine the firm in which there is greater variability in individual wages we shall compare the co-efficient of Variatim

Firm A

Given variance $(\sigma)^2 = 81$

$\sigma = \sqrt{81}$

=9

Co-efficient of variance

$$= \frac{\sigma}{\overline{X}} \times 100$$

$$= \frac{9}{186} \times 100$$

$$= \frac{900}{186}$$

$$= 4.84\%$$

Firm B

Given variance $(\sigma)^2 = 100$

$\sigma = \sqrt{100}$

=10

Co-efficient of variance

$$= \frac{\sigma}{\overline{X}} \times 100$$

$$= \frac{10}{175} \times 100$$

$$= \frac{1000}{175}$$

$$= 5.71\%$$

Since the Co-efficient of variation in case of firm B is greater there is greater variability in individual wages of firm B.

75. $\sum d = \sum (X - 5) = 8$

$\sum d^2 = \sum (X - 5)^2 = 40$

$$\overline{X} = A + \frac{\sum d}{N} = 5 + \frac{8}{20} = 5 + 40 = 5.40$$

$$\sigma_1 = \sqrt{\frac{\sum d^2}{N} - \left(\frac{\sum d}{N}\right)^2}$$

$$= \sqrt{\frac{40}{20} - \left(\frac{8}{20}\right)^2}$$

$$= \sqrt{2 - \frac{64}{400}}$$

$$= \sqrt{2 - 0.16}$$

$$= \sqrt{1.84}$$

$$= 1.36$$