Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1) All the questions are compulsory.

(2) Numbers written to the right indicate full marks of the question.

1 (a) Answer the following short answer questions :   4

(1) Write the value of slope for the line $2x + 4y + 5 = 0$.

(2) Find the modulus for the vector (2, 3, 1).

(3) Define Null Set.

(4) If $A = \{1, 2\}$ and $B = \{1\}$ then find $A \times B$.

(b) Answer in Brief : (any 1)   2

(1) Find the equation of straight line passing through the points (2, 3) and (5, 6).

(2) If $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $A = \{2, 3, 6, 7, 8\}$; and

$B = \{1, 2, 3, 5, 6\}$ then Verify that $(A \cap B)' = A' \cup B'$

(c) Answer in detail : (any 1)   3

(1) Find the mid point for the segment joined by the points (–2, 5) and (–6, 7)

(2) Find $\overline{u} = (1, 3, 1)$, $\overline{v} = (1, 2, 3)$ then find $|\overline{u} \times \overline{v}|$.

(d) Answer in detail : (any **1**)   **5**

(1) If $U = \{x/x \in N, x \le 10\}, A = \{x/x \in N, x^2 < 10\}$,

$B = \{2, 4, 6\}$ and $C = \{x/x^3 - 3x^2 - 4x = 0\}$

then verify the following :

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

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

(iii) $A' - B' = B - A$

(2) Find the points of trisection of line segment joined by the points $A(2, -2)$ and $(-7, 4)$.

2 (a) Answer the following short answer questions :   **4**

(1) If A is a matrix of order 3×2 and B is of 2×4 then find the order of AB.

(2) Define Symmetric Matrix.

(3) Define Singular Matrix.

(4) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ find $|A|$.

(b) Answer in brief : (any **1**)   **2**

(1) If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, then show that $A^2 - 2A = 0$.

(2) Evaluate : $\begin{vmatrix} 1 & -2 & 3 \\ 4 & 1 & -1 \\ 2 & 0 & 1 \end{vmatrix}$

(c) Answer in detail : (Any **1**)   **3**

(1) Express : $\begin{bmatrix} 2 & -1 & 3 \\ 4 & 1 & 2 \\ 3 & 1 & 4 \end{bmatrix}$ as the sum of a symmetric

and skew symmetric matrix.

(2) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$

(d) Answer in detail : (any **1**)   **5**

(1) Solve by Cramer's Rule :

$x + y + z = 4$

$2x - 3y + 4z = 33$

$3x - 2y - 2z = 2$

(2) Find the inverse of the matrix

$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

3 (a) Answer the following short answers :   **4**

(1) $\displaystyle\lim_{x \to a} \frac{x^n - a^n}{x - a} = $ _____

(2) $\dfrac{d}{dx}\left(a^x\right) = $ _____

(3) If $y = x^2 - 2x + 1$ then find $\dfrac{dy}{dx}$

(4) $\displaystyle\lim_{x \to 0} \frac{x^2 - 2x + 1}{2x + 3} = $ _____

(b) Answer in Brief : (any **1**)   **2**

    (1) Evaluate : $\lim\limits_{x \to 3} \dfrac{x^4 - 81}{x^3 - 27} =$ _____

    (2) If $y = \log\left(x + \sqrt{x^2 + 1}\right)$ find $\dfrac{dy}{dx}$.

(c) Answer in detail : (any **1**)   **3**

    (1) Evaluate :

        (i) $\lim\limits_{x \to 0} \dfrac{e^{4x} - e^{3x}}{x} =$ _____

        (ii) $\lim\limits_{x \to 1} \dfrac{x^2 - 3x + 2}{x^2 - 4x + 3} =$ _____

    (2) If $x = at^2$ and $y = 2at$ then find $\dfrac{dy}{dx}$.

(d) Answer the in detail : (any **1**)   **5**

    (1) If $y = Ae^{3x} + Be^{2x}$ then prove that

        $y_2 - 5y_1 + 6y = 0$.

    (2) If $x^y = e^{x-y}$ then prove that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$.

4 (a) Answer the following short answers :   **4**

    (1) Define : Primary Data

    (2) Define : Quantitative Data

    (3) Intersection of less than and more than curve gives the value of _____.

    (4) In histogram the width of the bar is equal or unequal ?

(b) Answer in brief : (any 1)   **2**

(1) Draw a frequency curve for the given data

$x:$	0	1	2	3	4
$y:$	2	4	6	7	10

(2) Prepare a lay out of the table representing Smoking Habit and Literacy of a Person.

(c) Answer the in brief : (any 1)   **3**

(1) Prepare a bar diagram for the given data of Sales showing in percentage of following items

Item	City A	City B
Pencil	35	40
Ball Pen	25	16
Erasers	09	12
Sharpners	14	15
Others	17	17

(2) There are 35% students in Commerce, 30% in Arts, 20% in Science, 10% in Engineering and 5% are in Medical streams out of 50,000 students. The Proportion of Boys and Girls in Commerce is 4:3. The number of Boys is two times than number of Girls in Arts. 60% are boys in Science Stream where as in Engineering 70% are boys. There is equal number of Boys and Girls in Medical. Prepare the proper table representing the data.

(d) Answer in detail : (any **1**)   **5**

  (1) Represent Histogram and frequency polygon of the same graph paper for the following data :

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	12	17	23	28	16

  (2) Draw the more than type curve for the following data :

Class	0-50	50-100	100-150	150-200	200-250	250-300
Frequency	10	15	20	28	30	40

5 (a) Answer the following short answers :   **4**

  (1) Define : Median

  (2) Mean is denoted by _____ in usual notations.

  (3) Find mean for 1, 3, 4, 5, 7.

  (4) What is formula to find mode using mean and median for the ungrouped data?

(b) Answer in brief : (any **1**)   **2**

  (1) Find the median of –1, 2, –3, 0, 5, 4, 7.

  (2) If $\bar{x} = 20$, $M = 18$ then find Z.

(c) Answer in brief : (any **1**)   **3**

  (1) Find the mean for 2.03, 2.30, 4.02, 5.08, 6.09, 7.80

  (2) If the coefficient of range is 0.8, then find the relation between highest value and lowest value.

(d) Answer in detail : (any 1) **5**

   (1) Find the variance and standard deviation for the following data :

x :	4	8	11	17	20	24	32
F :	3	5	9	5	4	3	1

   (2) Find the Standard Deviation for the following data of marks of the students :

Marks :	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of Students :	5	12	30	45	50	37	21

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