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MST-001

**POST GRADUATE DIPLOMA IN
APPLIED STATISTICS (PGDAST)**

Term-End Examination

December, 2024

**MST-001 : FOUNDATION IN MATHEMATICS AND
STATISTICS**

Time : 3 Hours

Maximum Marks : 50

Note : *Question No. 1 compulsory. Attempt any four questions from the remaining Question Nos. 2 to 7. Use of scientific calculator (non-programmable) is allowed. Use of Formulae and Statistics Table Booklet for PGDAST is allowed. Symbols have their usual meanings.*

1. State whether the following statements are true or false. Give reasons in support of your answers :

5×2=10

(a) If :

$$A = \{2, 4, 6, 7, 8\}$$

and

$$B = \{4, 6, 8\}$$

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are subsets of $U = \{1, 2, 3, 4, 6, 7, 8\}$, then the commutative law holds.

- (b) The sequence :

$$e^{x/y}, e^{2x/y}, e^{3x/y}, e^{4x/y}$$

form a geometric progression.

- (c) If :

$$x = 1 + 3t^2$$

and $y = 6t^2 + 18t + 1,$

then $\frac{dy}{dx} = \frac{12t+1}{6t}.$

- (d) Two matrices are said to be equal if they are of the same order.
- (e) The more than and less than ogives of a frequency distribution cut at mean.

2. (a) Find the following sum : 4

$$0.6 + 0.61 + 0.62 + \dots \text{ to 110 terms.}$$

- (b) Expand $(4 - 3x)^{2/3}$ using binomial theorem for rational exponent. 4
- (c) Show that the set $B = \{3, 7, 11, 15, 19, \dots\}$ is an enumerable set. 2

3. (a) Solve the following system of equations using Cramer's rule : 3

$$x + 2y = -5$$

$$2x - 3y = 4$$

- (b) Evaluate the following determinant : 3

$$\begin{vmatrix} x+3 & x & x \\ x & x+3 & x \\ x & x & x+3 \end{vmatrix}$$

- (c) Evaluate the following integral : 4

$$\int_6^7 \frac{2x+7}{(x-3)(x+1)(x-4)} dx$$

4. (a) Find the derivative of the following function : 3

$$f(x) = \sqrt{\frac{x^3+1}{x+1}}$$

- (b) Distinguish between quantitative and qualitative data giving suitable examples. 2
- (c) If : 3

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

then show that $\frac{A-A'}{2}$ is a skew-symmetric matrix and $\frac{A+A'}{2}$ is a symmetric matrix.

- (d) Evaluate : 2

$$\int \frac{x}{x+2} dx$$

5. (a) A function $f(x)$ is defined as follows : 4

$$f(x) = \begin{cases} \frac{1}{3} - x & ; \text{ when } 0 < x < \frac{1}{3} \\ 0 & ; \text{ when } x < \frac{1}{3} \\ \frac{5}{3} - 5x & ; \text{ when } \frac{1}{3} < x < 1 \end{cases}$$

Prove that $f(x)$ is continuous at $x = \frac{1}{3}$.

- (b) How many 4 letters words are possible using 6 letters a, b, c, d, e, f such that in each case : 4

(i) Two letters a and b are always included.

(ii) Two letters c and d are always excluded.

- (c) Write *two* differences between primary and secondary data. 2

6. (a) Draw a suitable bar diagram of the sales data given ahead : 3

Year	Sales of Scooties (in numbers)
2015	200
2016	460
2017	520
2018	680
2019	720
2020	2930

- (b) Draw a histogram for the following frequency data : 3

Wages (in ₹ '000)	No. of Workers
0-5	40
5-10	80
10-15	90
15-20	100
20-25	130
25-30	150
30-35	120
35-40	90
40-45	80
45-50	50

- (c) Distinguish between four measurement scales giving a suitable example. 4

7. (a) Find : 5

$$A^{-1},$$

where :

$$A = \begin{bmatrix} 3 & 0 & 3 \\ 0 & -1 & -2 \\ 4 & -2 & 5 \end{bmatrix}$$

- (b) A company is started by the four persons A, B, C and D and they distribute the profit or loss among themselves in proportion of 3 : 4 : 1 : 2. In 2021 year, the company earned a profit of ₹ 15,450. Represent the percentage shares of their profits in a pie chart. 5

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