

**POST GRADUATE DIPLOMA IN
APPLIED STATISTICS
(PGDAST)/MASTER OF SCIENCE
(RENEWABLE ENERGY AND
ENVIRONMENT) (MSCRWEE)**

Term-End Examination

June, 2023

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

Time : 3 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt any **four** questions from the remaining Question nos. 2 to 7.*

(iii) *Use of scientific calculator (non-programmable) is allowed.*

(iv) *Use of Formulae and Statistical Tables Booklet for PGDAST is allowed.*

(v) *Symbols have their usual meanings.*

1. State whether the following statements are True or False. Give reasons in support of your answers. $5 \times 2 = 10$

(a) The set $A = \{4, 16, 64, 256, \dots\}$ is enumerable set.

- (b) The value of $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$ is 6.
- (c) If $A = \begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix}$, then $B = \frac{1}{2}(A + A')$ is skew-symmetric matrix.
- (d) H-spread in box plot is calculated by the average of the upper and lower hinges.
- (e) If $4\theta + 1$, $5\theta + 3$ and $9\theta + 2$ are three consecutive terms of an A.P., then the value of θ is 1.
2. (a) Let $f : \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(n) = 2n; n \in \mathbb{N}$.
Express the function diagrammatically.
Also write domain, range and co-domain of the function. 3
- (b) Find the three numbers in G.P. whose sum is 38 and product in 1728. 3
- (c) Using all the letters of the word ALLAHABAD : 4
- (i) How many different words can be formed ?
- (ii) In how many of them, vowels occupy the even positions ?
- (iii) In how many of them, both L do not come together ?

3. (a) If $x^y = e^{x-y}$, show that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$. 3

(b) Evaluate : 5

$$\int \frac{3x + 1}{(x - 2)^2(x + 2)} dx.$$

(c) Define one-one function with an example. 2

4. (a) Solve the following system of equations using Cramer's rule : 5

$$5x - 7y + z = 11$$

$$6x - 8y - z = 15$$

$$3x + 2y - 6z = 7.$$

(b) What type of measurement scales are used in Statistics ? Explain them with examples.

5

5. (a) The number of units sold of a product in 19 weeks are given as follows :

27, 42, 31, 20, 33, 27, 37, 28, 34, 44, 25, 39,
26, 31, 26, 33, 46, 48 and 56

Draw a box plot and interpret the results, obtained. 8

(b) Differentiate between qualitative and quantitative data. 2

6. (a) The number of customers visited in a bank for 30 days are given below :

25, 10, 12, 32, 32, 27, 38, 43, 39, 55, 29, 38,
57, 08, 06, 13, 27, 25, 29, 53, 55, 45, 35, 48,
47, 59, 15, 19, 48, 55

- (i) Compute the suitable class width.
(ii) Classify the above data using computed class intervals.
(iii) Draw the histogram. 1+3+2

- (b) Expand $(x^2 + 2a)^5$ by binomial theorem. 4

7. (a) Define continuity of a function. Also show that the function :

$$f(x) = \begin{cases} \frac{1}{e^x - 1}; & \text{when } x \neq 0 \\ \frac{1}{e^x + 1} & \\ 0 & ; \text{ when } x = 0 \end{cases}$$

is discontinuous at $x = 0$. 5

- (b) Prove that : 5

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$