POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)/ MASTER OF SCIENCE (RENEWABLE ENERGY AND ENVIRONMENTAL) (MSCRWEE)
Term-End Examination
June, 2025

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 (non-programmable) calculator 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 answer :   5×2=10

   (a) If :

   $$A = \{x : 2x + 5 < 17, \, x > 4, \, x \in N\}$$

   and $B = \{x : x^2 - 11x + 30 = 0, \, x \in N\}$

   then A = B.

   (b) $\int_0^1 x^2 \, dx = \dfrac{1}{3}$.

   (c) $\lim\limits_{x \to 1} \dfrac{x^2 + x - 2}{x^2 - 5x + 4} = 0$.

   (d) The two ogives of less-than-type and more-than-type of a distribution intersect at mode.

   (e) If :

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

   and $B = [1 \quad 2 \quad 3]$,

   then $AB = [1 \quad 4 \quad 9]$.

2. (a) How many 5-letter words are possible using 8 letters a, b, c, d, e, f, g, h such that : 5

(i) Two letters a, b are always included ?

(ii) Three letters a, c, d are always excluded ?

(b) If :

$$A = \{2, 4, 6\}, \ B = \{1, 2, 3, 4, 5\}$$

are the subsets of the universal set :

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\},$$

then verify De Morgan's law $(A \cup B)' = A' \cap B'$. 5

3. (a) Find the local maximum and minimum values of the function : 4

$$f(x) = 2x^3 - 15x^2 + 36x + 9$$

(b) Evaluate : 6

(i) $\int \dfrac{2x}{(1+x^2) \log (1+x^2)} dx$

(ii) $\int_0^2 \dfrac{(2x+7) dx}{(x-3)(x+1)(x-4)}$

4. (a) If :

$$3X + 2Y = \begin{bmatrix} 4 & 13 \\ 18 & 13 \end{bmatrix}$$

and $\quad 2X - 3Y = \begin{bmatrix} 7 & 0 \\ -1 & -13 \end{bmatrix}$

then find matrices X and Y. 　　　5

(b) Solve the following system of equations by using Cramer's rule : 　　　5

$$3x + 5y = -11$$

$$2x - 3y = 18.$$

5. (a) Draw two ogives from the following data : 　　　5

Class	Frequency
0—10	3
10—20	6
20—30	10
30—40	13
40—50	20
50—60	18
60—70	15
70—80	9
80—90	6

Also, find the median.

(b) Draw a suitable diagram for the data of monthly expenditure (in ₹) of two families given below : 5

Items	Family A	Family B
Food	4,000	5,000
Clothing	2,000	2,000
Education	2,800	2,000
Miscellaneous	1,200	1,000

6. (a) Find the sum of the series : 3

$$\frac{2}{9} + \frac{2}{3} + 2 + 6 + \dots + 486$$

(b) Show that : 3

$$4^{1/4} . 4^{1/8} . 4^{1/16} \dots \infty = 2$$

(c) Evaluate : 4

$$\lim_{x \to 3} \frac{\sqrt{5x-6} - \sqrt{x+6}}{x^2 - 9}$$

7. (a) What are the different methods of collection of primary data ? Describe the Telephonic Interview Method with an example. 5

(b) Show that :   3

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

(c) If $a_{ij} = |i - 2j|$, then write A, where

$A = (a_{ij})_{2 \times 2}$.   2

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