MST-001

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

June, 2022

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 questions no. 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.   *5×2=10*

    (a) If $A = \{x : 2x + 5 < 15, x > 3, x \in N\}$ and

         $B = \{x : x^2 - 9x + 20 = 0, x \in N\}$,

         then $A = B$.

(b) The function $f(x) = \begin{cases} \dfrac{|x|}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$

is not continuous at the origin.

(c) Two matrices $A = \begin{bmatrix} 2 & 4 \\ 3 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 & 5 \\ 3 & 8 & 6 \end{bmatrix}$

are comparable matrices.

(d) The average sales of 15 stores in the year 2019 is an example of chronological classification.

(e) The sum of the series $1 + \dfrac{1}{3} + \dfrac{1}{9} + \dfrac{1}{27} + \ldots$ is $\dfrac{3}{2}$.

2. (a) In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy newspapers A and B, 3% families buy newspapers B and C, and 4% families buy newspapers A and C. If 2% families buy all the three newspapers, then find the number of families which buy

(i) newspaper A only.

(ii) newspaper B only.

(iii) None of newspapers A, B or C. 7

(b) Find the sum of the first 20 terms of an AP, in which the 3rd term is 7 and the 7th term is two more than thrice of its 3rd term. *3*

3. (a) Determine the local maximum and minimum values of the function

$$f(x) = x^3 - 6x^2 + 9x - 8.$$ *6*

(b) Evaluate $\displaystyle\int_{1}^{2} \frac{1}{(x+1)(x+2)} \, dx.$ *4*

4. (a) A mixture is to be made of three foods A, B and C. The foods A, B and C contain nutrients P, Q and R as shown below :

Food	Amount of Nutrient (mg per gram)		
	P	Q	R
A	1	2	5
B	3	1	1
C	4	2	1

How can a mixture be formed which will have 8 mg of P, 5 mg of Q and 7 mg of R ? Use matrix approach. *7*

(b) Differentiate between discrete and continuous data, with example. *3*

5. For the following data on the weekly wages of 220 workers :

Weekly Wages	Number of Workers
0 – 10	45
10 – 20	55
20 – 30	70
30 – 40	40
40 – 50	10

(a) Form both types of cumulative frequency distributions.

(b) Prepare relative and percentage frequency distributions.

(c) Draw Histogram and both types of ogives.

(d) Determine median graphically. *2+2+5+1*

6. (a) How many four-digit numbers can be formed with distinct digits ? *2*

(b) With the help of a Venn diagram, justify the following : *4*

(i) $A \subseteq A \cup B$

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

(c) Three types of crops : vegetables, fruits and flowers are planted in two fields A and B. The data for area under each crop for both fields are given as follows :

Crops	Area under Crop (in sq. ft.)	
	A	B
Vegetables	30	40
Fruits	35	45
Flowers	15	35

Draw the percentage bar chart to compare the cropping patterns of both fields. *4*

7. (a) Show that *4*

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

(b) Evaluate $\lim_{x \to 1} \dfrac{(x+x^2+x^3+...+x^n)-n}{x-1}$. *3*

(c) Differentiate between logarithm and exponential functions, with examples. *3*

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