No. of Printed Pages : 7 **MST-001**

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

December, 2021

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.*

P. T. O.

1. State whether the following statements are True *or* False. Give reasons in support of your answer.   5×2=10

   (a) The shaded region of the given Venn diagram denotes $A - B'$.
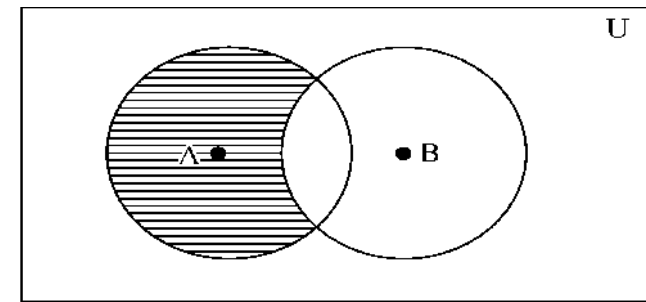
   (b) The value of the definite integral :

   $$\int_{-109}^{109} \left(x^3 + x\right) dx$$

   is zero.

   (c) A square matrix A is said to be skew-symmetric matrix is $A' = \left(A'\right)'$.

   (d) If more than and less than ogives of a data cuts at a point (50, 60), then median of the data is 60.

   (e) The number of ways in which two friends can sit in three vacant seats in a bus is 6.

2. (a) Show that function $f : R \rightarrow R$ given by :

$$f(x) = \begin{cases} 1 & \text{if} \quad x > 0 \\ 0 & \text{if} \quad x = 0 \\ 1 & \text{if} \quad x < 0 \end{cases}$$

   is neither one-one nor onto. Also find domain and range of the function.   5

   (b) In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% B and 10% C respectively. It is also given that 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the newspapers, find the number of families which buy :   5

   (i) at least one newspaper

   (ii) only A and not C

   (iii) none of A, B and C.

3. (a) Evaluate :   3

$$\int \frac{x}{(x-1)(x-2)(x-3)} \, dx$$

   (b) Find local maximum and minimum values of the function :   4

$$f(x) = 2x^3 - 15x^2 + 36x + 20$$

   (c) Evaluate :   3

$$\int_2^5 |x - 3| \, dx$$

4. (a) Solve the equations using matrix method :   7

$$x + 2y + z = 7$$

$$x + 3z = 11$$

$$2x - 3y = 1$$

   (b) Write the main steps to prepare a questionnaire.   3

5. (a) The following data represent the expenditure of the two families on various items. Represent the data by a suitable diagram :   5

S. No.	Item	Expenditure	
		Family A (₹)	Family B (₹)
1.	Food	12,000	17,000
2.	Clothing	5,000	8,000
3.	House Rent	6,000	9,000
4.	Fuel and Electricity	2,500	3,000
5.	Miscellaneous	4,500	8,000

(b) Draw two ogives from the following data :

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

Hence find median using the ogives.   5

6. (a) The following data represent the amount of insurance (in '000) purchased by 30 people from an insurance company in a given week :

30, 42, 50, 33, 75, 82, 110, 55, 58, 65, 62, 45, 47, 65, 85, 90, 95, 92, 45, 120, 125, 100, 105, 115, 70, 77, 115, 120, 75, 80

Construct a stem and leaf diagram for this data.   2

(b) Categorise each of the following as either nominal, ordinal, interval or ratio measurement. Justify your classification : 4

(i) Distance of each state of India from Delhi.

(ii) Number of tourists coming India in different years.

(iii) Name of the country from which tourists come India.

(iv) Evaluating the way of teaching of professors on a scale of one to five.

(c) Evaluate without expending :   2

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ b+c & c+a & a+b \end{vmatrix}$$

(d) Distinguish between discrete and continuous data with example.   2

7. (a) In an examination, a candidate has to pass in each of the 6 subjects. In how many ways can he/she fail ?   2

(b) Show that :

$$\lim_{x \to 2} \frac{|x - 2|}{x - 2}$$

does not exist.　　　　　　　　　　3

(c) Write different components of a table and types of classification.　　　　2

(d) If two sets are infinite, then explain the way of checking their equivalence. Are the sets A = {1, 3, 5, 7, ...} and B = {0, 8, 24, 48, ...} equivalent ?　　　3

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