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MST-001

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

Term-End Examination

June, 2020

**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 reason in support of your answer :

$$5 \times 2 = 10$$

(a) If $A = \{0, 1, 2, 3, 4\}$, $B = \phi$, then $A \cup B = \{\phi, 0, 1, 2, 3, 4\}$.

- (b) The function $f(x) = x^2 - 6x + 2$ is minimum at $x = 3$.

(c) If $A = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}$ and $B = [4 \ 5 \ 6]$, then

$$AB = [16 \ 25 \ 36].$$

- (d) The time in which an examinee completes the MST-001 paper come under discrete data.

- (e) By using a histogram, one can find quartiles.

2. (a) Which term of the series 12, 9, 6, is equal to - 30 ?

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- (b) If the third term of a G. P. series is square of the first term and the fifth term is 64, find the series.

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- (c) If $A = \{1, 2, 3\}$, $B = \{2, 3, 4, 5\}$ and $C = \{2, 4, 6, 8\}$, then verify that : 2

$$A \cap (B - C) = (A \cap B) - (B \cap C)$$

- (d) Find domain and range of the function

$$\left| x - \frac{1}{2} \right|. \quad 2$$

3. (a) Show that $\lim_{x \rightarrow 1} f(x)$ exists and is equal to

$$f(1), \text{ where :} \quad 3$$

$$f(x) = \begin{cases} x + 1 & \text{for } x \leq 1 \\ 3 - x^2 & \text{for } x > 1 \end{cases}$$

- (b) Prove that : 3

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$$

- (c) Check the continuity of the function

$$\frac{|x - 3|}{x - 3} \text{ at } x = 3. \quad 4$$

4. (a) A company has examined its cost structure of manufacturing a certain article and has determined that the total cost (C) and the number of articles (x) manufactured are related as :

$$C = 5 + \frac{48}{x} + 3x^2$$

Find minimum value of C 4

- (b) Given the matrices A, B, and C, where : 3

$$A = \begin{bmatrix} 2 & 3 & -1 \\ 3 & 0 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} \text{ and } C = [1 - 2]$$

Verify that :

$$(AB) C = A (BC)$$

- (c) A sample of 40 PGDAST learners answered the following questions asked in a survey :
- (i) What is your gender ?
 - (ii) What is your age ?
 - (iii) What is your current major area of study ?
 - (iv) What is your percentage of marks in graduation ?

(v) What is your current employment status ?

(vi) How many different jobs have you held in the past 10 years ?

For each of the question mentioned above determine whether the data thus obtained come under nominal, ordinal, interval and ratio scale. Give reason in support of your answer.

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5. (a) Represent the following information of the average marks of PGDAST learners by a suitable diagram :

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Year	Average marks			
	MST-001	MST-002	MST-003	MST-004
2016	78	65	70	60
2017	82	60	72	62

- (b) The data given below represents the total fat (in grams per serving) for a sample of 16 chicken sandwiches from fast-food chains :

7, 8, 4, 5, 16, 20, 20, 24, 19, 30, 23, 20, 19,
30, 35, 6

Construct a box plot for the above data. 6

6. (a) In an examination of statistics, a candidate has to select 7 questions from three different groups A, B and C, which contains 3, 4, 4 questions respectively. In how many different ways can a candidate select at least 2 questions from each group ? 5

- (b) How many different signals are possible with 3 red, 4 white and 2 green flags by using all at a time in a queue ? 3

- (c) Find $\frac{dy}{dx}$, where : 2

$$y = \frac{x^2 - 1}{x^2 + 1}$$

7. (a) Find : $\int_0^6 f(x) dx$ 4

$$\text{where } f(x) = \begin{cases} x^2 + 3 & 0 \leq x < 3 \\ 2\sqrt{x} & 3 \leq x < 4 \\ e^{-x} - e^{-2x} & 4 \leq x \leq 6 \end{cases}$$

- (b) The following data represent the electricity bill (in ₹) during July 2017 for a random sample of 25 one-bedroom apartments in a metro city : 6

696, 660, 890, 780, 1000, 1150, 900, 660,
850, 800, 1100, 700, 740, 820, 970, 900,
750, 780, 600, 700, 750, 1010, 690, 760, 800

- (i) Form a frequency distribution by taking class intervals as 600-700, 700-800,
- (ii) Construct a histogram.
- (iii) Construct ogives.
- (iv) Find median with the help of ogives.