No. of Printed Pages : 5

MST-001

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

00682

December, 2017

MST-001 : FOUNDATION IN MATHEMATICS AND STATISTICS

Time : 3 hours *Maximum Marks : 50*

Note :

(i) *Attempt **all** questions. Questions no. 2 to 5 have internal choices.*

(ii) *Use of scientific calculator is allowed.*

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

(iv) *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) The function $f(x) = |x|$ is an even function.

(b) The ogive of less-than-type and more-than-type of a distribution intersect at mode.

(c) If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $B = [1\ \ 2\ \ 3]$, then $AB = [1\ \ 4\ \ 9]$.

(d) If $f(x) = \begin{cases} 2 - x^2, & x \neq 1 \\ 2 + x^2, & x = 1 \end{cases}$, then $\lim_{x \to 1} f(x) = 1$.

(e) The data of number of cars on the roads of Delhi at an even date under the Even-Odd scheme of Delhi Government, is continuous.

2. (a) How many terms are there in the sequence $-1, -\frac{1}{4}, \frac{1}{2}, ..., 14$? *2*

(b) Show that $4^{1/4} \cdot 4^{1/8} \cdot 4^{1/16} \cdot .... \cdot \infty = 2$. *3*

(c) 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*

OR

(a) Find the total number of ways of selecting 11 players out of 15 players such that

(i) two particular players are always included,

(ii) two particular players are always excluded. *3+3*

(b) Define one-one function and onto function with examples. *2+2*

3. (a) Find the derivative of the function

$$y = (3x + 2)^4 (6x + 3)^6 \text{ w.r.t. x.}$$ 5

(b) Evaluate : 5

$$\int_0^1 \frac{2x + 5}{(x^2 + 5x + 7)^5} dx$$

OR

(a) Check the continuity of the following function at point x = 2 : 4

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

(b) Find $\frac{dy}{dx}$ if $x = 2 + 4t^2$, $y = 9t^2 + 4t + 1$. 3

(c) Find the points of local maxima or minima of the function $f(x) = 2x^3 - 15x^2 + 36x + 9$. 3

4. (a) Draw the histogram for the following data : 6

Class Interval	*Frequency*
0 – 10	3
10 – 20	8
20 – 30	10
30 – 50	12
50 – 70	20
70 – 100	15

(b) The marks (out of 50) of 20 students in MST-001 are given below :

21, 02, 18, 33, 40, 06, 50, 40, 46, 15

40, 28, 17, 35, 26, 32, 21, 46, 32, 50

Draw a simple stem-and-leaf display by taking stem width at 10. *4*

OR

(a) Draw a suitable diagram for the data of monthly expenditure (in ₹) of two families given below : *6*

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

(b) The wages (in ₹) per day of 25 workers in a factory are given below :

100, 250, 120, 340, 500, 250, 150, 300, 460, 350, 400, 200, 150, 150, 180, 400, 220, 340, 160, 500, 430, 250, 300, 200, 350

(i) Construct a continuous frequency distribution of the above data by taking suitable class width, and *2*

(ii) Prepare the relative frequency distribution. *2*

5. (a) Identify, giving reasons, which scale is used in the classification of soldiers of India based on their

(i) region,

(ii) performance,

(iii) education, and

(iv) height. *4*

(b) Solve the following system of equations by using Cramer's rule : *6*

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

$$2x - 3y = 18$$

OR

(a) Show that

$$\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x - y)(y - z)(z - x).$$ *5*

(b) What do you mean by Primary data and Secondary data ? Also give an example for each. *5*