POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination   02921

June, 2019

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.

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1. State whether the following statements are **True** or **False**. Give reasons in support of your answer.   5x2=10

    (a) The rule f shown in the following figure is a function :
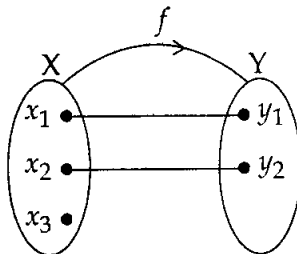
    (b) A function $f(x)$ is said to be continuous at point $x = a$ if LHL = RHL at that point.

(c) In football game, the number allotted to a participant comes under ordinal scale.

(d) If $A = \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$, then $(A)' = \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$.

(e) If a coordinator of PGDAST programme classifies the data of learners in the programme on the basis of gender of the learners, then this classification comes under quantitative classification.

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

$5, \ 5+\sqrt{3}, \ 5+2\sqrt{3}, \ \_\_\_\_, \ 5+20\sqrt{3}$

(b) If $f : N \to N$ defined by

$f(x) = (2+x)^{x-1}, \ x \in N$

(i) Express the function diagrammatically,

(ii) Write domain, co-domain and range of the function.

(iii) Is the function one to one ? If yes, explain it. 1+2+2

(c) If $A = \{1, 3, 5\}$, $B = \{2, 3, 4, 5\}$ are the subsets 2 of the universal set $U = \{1, 2, 3, 4, 5, \ ....., 10\}$, then verify $(A \cup B)' = A' \cap B'$.

3. (a) A function $f(x)$ is defined as follows : **3**

$$f(x) = \begin{cases} \dfrac{1}{2} - x \text{ ; when } 0 < x < \dfrac{1}{2} \\[2mm] 0 \text{ ; when } x = \dfrac{1}{2} \\[2mm] \dfrac{3}{2} - 3x \text{ ; when } \dfrac{1}{2} < x < 1 \end{cases}$$

Is $f(x)$ continuous at $x = \dfrac{1}{2}$?

(b) Find : $\displaystyle\int \dfrac{x+5}{(x+1)(x+2)^2}\, dx$ **5**

(c) If $A = \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 6 & 4 \end{bmatrix}$, then show **2**
that $(A+B)' = A' + B'$.

4. (a) Show that **5**

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$$

(b) Find derivative of the function : **3**

$y = (6x+5)^4 (4x+8)^3$.

(c) Write four differences between primary data **2**
and secondary data.

5. A company has conducted a market survey with a sample of size 50 regarding acceptability of a new product which the company wants to launch. The scores of the respondents on the appropriate scale are as follows. **3+3+4**

40	35	40	42	30	39	8	47	25	20
36	19	26	44	25	48	15	20	40	26
48	45	44	39	41	6	22	25	16	38
27	32	28	25	40	35	18	35	30	30
40	37	15	20	18	35	21	27	40	10

(i) Prepare a frequency distribution with class interval of width 10.

(ii) Draw histogram of obtained frequency distribution.

(iii) Prepare less than and more than frequency distributions.

6. (a) The cooking oil preferences of 100 families **5** in two regions I, and II were recorded by a researches in the following table :

Cooking Oil	Number of families	
	I	II
Sun flower	13	13
Soybean	15	20
Mustard	40	35
Ghee	20	22
Other	12	10
Total	100	100

Draw a suitable diagram for the above data.

(b) Draw box plot for the following data. 5

Score of 16 boys out of 50 are given as follows :

17, 19, 20, 24, 26, 27, 18, 25, 29, 30, 31, 28, 19, 22, 22, 27

7. (a) A cricket team of 11 players is to be formed 4 from 16 players including 4 bowlers and 2 wicket-keepers. In how many different ways can a team be formed so that the team contains.

   (i) exactly 3 bowlers and 1 wicket-keeper

   (ii) at least 3 bowlers and 2 wicket-keepers.

(b) A researcher collected the following data 4 about different points of households survey. Determine whether the data thus obtained come under nominal, ordinal, interval or ratio scale. If the data come under the interval or ratio scale, determine whether the data are discrete or continuous.

   (i) The caste of a family.

   (ii) Number of members in a family.

   (iii) Age of the oldest person in a family.

   (iv) Education of the family members.

   (v) Monthly income of a family.

(c) Show that sum of the series : 2

$$\sqrt{2}, \ \frac{1}{\sqrt{2}}, \ \frac{1}{2\sqrt{2}}, \ ----, \ \infty \quad \text{is } 2\sqrt{2} \ .$$