

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

**Term-End Examination**

**December, 2022**

**MST-002 : DESCRIPTIVE STATISTICS**

*Time : 3 hours*

*Maximum Marks : 50*

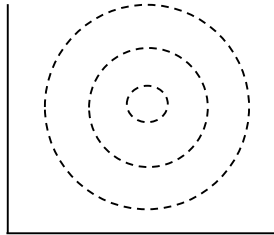
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**Note :**

- (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 answers.  $5 \times 2 = 10$
- (a) For a certain distribution, if the arithmetic mean is 45, median is 48 and Karl Pearson's coefficient of skewness is  $-0.4$ , then mode of the distribution will be 54.

- (b) If the scatter diagram of a bivariate data shows the pattern as follows :



then there exists high degree of linear relationship between the variables.

- (c) If  $r = 0.8$ ,  $b_{XY} = 0.5$ ,  $\sigma_Y^2 = 16$ , then  $\sigma_X$  will be 2.5.

- (d) A researcher observed the class frequencies as :

$N = 1000$ ,  $(A) = 525$ ,  $(B) = 485$ ,  $(C) = 127$ ,  
 $(AB) = 189$ ,  $(AC) = 140$ ,  $(BC) = 85$ .

Is there a mistake of some sort ?

- (e) In a bivariate distribution, if  $r_{12} = 0.6$ ,  $r_{23} = 0.54$  and  $r_{13} = 0.54$ , then correlation coefficient between  $X_1$  and  $X_2$  after eliminating the linear effect of  $X_3$  on  $X_1$  and  $X_2$  is 0.4353.

2. (a) The first four moments of a distribution about the value 2 are 1, 2·5, 5·5 and 16. Show that mean = 3, variance = 1·5 and distribution is symmetric and platykurtic. 5

(b) For the data 20, 40, 60, 80, 90, what should be the values of A and B so that

(i)  $\sum_{i=1}^5 (X_i - A)^2$  is minimum,

(ii)  $\sum_{i=1}^5 |X_i - B|$  is minimum. 3

(c) Cities A, B and C are equidistant from each other. A motorist travels from A to B at the speed of 30 km per hour, from B to C at 40 km per hour and from C to A at 50 km per hour. Determine the average speed for the entire trip. 2

3. (a) Define correlation. Also write the assumptions and properties of correlation coefficient. 5

(b) Calculate the Spearman's coefficient of rank correlation from the following data : 5

X	57	16	24	65	16	16	9	40	33	48
Y	19	6	9	20	4	5	6	24	13	13

4. (a) What is the difference between multiple correlation and partial correlation ? 2
- (b) Give the following data :  
 $r_{12} = 0.8, r_{31} = 0.6, r_{32} = 0.6$   
 Find
- (i) Correlation coefficient between  $X_2$  and  $X_3$  keeping  $X_1$  constant ; and  $X_1$  and  $X_3$  keeping  $X_2$  constant.
- (ii) Correlation coefficient of  $X_1$  on  $X_2$  and  $X_3$  ; and  $X_2$  on  $X_1$  and  $X_3$ . 6
- (c) Write three properties of regression coefficients. 2

5. (a) In a locality, a number of houses were examined for the presence or absence of certain facilities in them : namely A : car parking, B : good sewage system, and C : airy rooms. If the following class frequencies are computed :

$$(ABC) = 85, (AB\bar{C}) = 60, (A\bar{B}C) = 42,$$

$$(A\bar{B}\bar{C}) = 25, (\alpha BC) = 18, (\alpha B\bar{C}) = 12,$$

$$(\alpha\beta C) = 47, (\alpha\beta\bar{C}) = 27$$

then, calculate the frequencies of those classes which show presence of the facilities. Also find the total number of houses surveyed. 5

- (b) Fit an exponential curve of the type  $Y = ae^{bX}$  from the following data using the method of least squares : 5

X	1	2	4
Y	5	10	30

6. Calculate the expected frequencies for the following data presuming two attributes: Condition of home and Condition of the child.

Condition of Home \ Condition of Child	Clean	Dirty
Clean	70	50
Fairly clean	80	20
Dirty	35	45

Determine amount of association between both the attributes when  $C_{\max} = 0.816$ .

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7. (a) For a mesokurtic distribution, the first moment about 7 is 23 and the second moment about origin is 1000. Find the coefficient of variation and the fourth moment about mean.

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- (b) Find the regression coefficients from the following regression lines :

$$2X + Y + 2 = 0$$

$$3X + 2Y + 1 = 0$$

Hence, find the coefficient of correlation.

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