[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 5757 **K**

Unique Paper Code : 2372011101

Name of the Paper : Descriptive Statistics

Name of the Course : **B.Sc. (Hons.) Statistics (NEP-UGCF)**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **6** questions in all.
3. Question No. **1** is compulsory.
4. Attempt **5** more questions selecting at least **2** questions from each section.
5. Use of non-programmable calculator is allowed.

1. (a) Fill in the blanks

(i) An Ogive curve helps in determining the value of ________________ .

(ii) Interquartile range excludes ______% of values.

(iii) The sum of 10 items is 12 and sum of their squares is 16.9. Then variance is ______________

(iv) If the kurtosis of a distribution is 3, it is called ___________ distribution

(v) For a symmetrical distribution Q_1=25 and Q_3=45, the median is ________.

(vi) For n attributes, the total class frequencies are _______ , and the total number of ultimate class frequencies are ____________.

(vii) If $r(X, Y) = 0.2$, then $r(2X + 3, -3Y + 4) =$ ___________.

(viii) If both the regression lines are perpendicular to each other, then we say that there is _________correlation between X and Y.

(ix) If one of the regression coefficients is greater than unity, the other must be ______.

(b) For the series A and series B of observations X and Y respectively, $\bar{x} = 18$, $\sigma_x^2 = 9$, $\bar{y} = 10$ and $\sigma_y^2 = 4$. Which series is more consistent? Give reason.

(c) Given (A) = (α) = (B) = (β) = $\frac{N}{2}$, Show that (AB) = (αβ).

(d) The following data pertain to the marks in subjects A and B in certain examination.

	A	*B*
Mean	39.5	47.5
sd.	10.8	16.8

and $r = 0.42$. Find the two regression lines. Give the estimate marks of B for candidate who secured 50 marks in A. (1x9, 2x3)

Section A

2.(a) Explain four types of measurement scales with one example of each.

(b) Show that in a discrete series if deviations are small compared with mean M so that $(x/M)^3$ and higher powers of (x/M) are neglected, we have

(i) $G = M\left(1 - \frac{1}{2}\frac{\sigma^2}{M^2}\right)$ (ii) $M^2 - G^2 = \sigma^2$.

where M is the arithmetic mean, G is the geometric mean, H is the harmonic mean and σ is the standard deviation of the distribution. (7,8)

3.(a) For a group of 200 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on, it was discovered that the scores 47 and 31 were misread as 74 and 13 respectively. Find the correct mean and standard deviation corresponding to the correct figures.

(b) If n_1, n_2 are the sizes, $\bar{x}_1$, $\bar{x}_2$ the means, and σ_1, σ_2 the standard deviations of two series, then prove that standard deviation 'σ' of the combined series of size $n_1 + n_2$ is given by:

$$\sigma^2 = \frac{1}{n_1 + n_2}\left[n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)\right]$$

where $d_1 = \bar{x}_1 - \bar{x}$, $d_2 = \bar{x}_2 - \bar{x}$ and $\bar{x} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$, is the mean of the combined series. (7,8)

4.(a) Define moments about origin and moments about mean of a frequency distribution. Establish the relationship between moments about mean in terms of moments about origin for first three moments.

(b) In a series of measurements we obtain m_1 values of magnitude x_1, m_2 values of magnitude x_2, and so on. If $\bar{x}$ is the mean value of all the measurements, prove that the standard deviation is $\sqrt{\left(\frac{\sum m_r(k-x_r)^2}{\sum m_r}-\delta^2\right)}$, where $\bar{x}=k+\delta$ and k is any constant.

(7,8)

Section - B

5.(a) Explain the following (i) order of a class (ii) Ultimate Classes (iii) Dichotomy. Find the total number of class frequencies of all orders for n attributes.

(b) Given the following positive frequencies, obtain all the ultimate class frequencies.

N=12000, (A)=977, (B)=1185, (C)=596, (AB)=453, (AC)=284, (BC)=250, (ABC)=127. (7, 8)

6.(a) Define Yule's coefficient of association (Q) and coefficient of colligation (Y), Show that, $Q=\frac{2Y}{1+Y^2}$.

(b) If X and Y are two random variables with variances σ_X^2 and σ_Y^2 respectively, and r is the coefficient of correlation between them. If $U = X+kY$ and $V = X+(\sigma_X/\sigma_Y)Y$, find the value of k so that U and V are uncorrelated. (7,8)

7. (a) Define the principle of least squares to fit the curve $y=a+bx+cx^2$ to a given set of n points $\{(x_i,y_i); i=1,2,\dots.n\}$.

(b) What is Spearman's rank correlation coefficient? Calculate Spearman's coefficient of rank correlation for the following data:

X	53	98	95	81	75	61	59	55
Y	47	25	32	37	30	40	39	45

(7,8)

P.T.O.

8. (a) Show that the angle θ, between the two lines of regression is

$$tan\,\theta = \frac{1-r^2}{|r|}\left(\frac{\sigma_x.\sigma_y}{\sigma_x^2+\sigma_y^2}\right)$$

where σ_x and σ_y, are the standard deviations of X and Y respectively, and r is the correlation coefficient between X and Y. Also, interpret the cases when $r = 0$ and $r = 1$.

(b) For 10 observations on price (X) and supply (Y) the following data were obtained (in appropriate units) : $\Sigma X = 130, \Sigma Y = 220$, ΣX^2=2288 , $\Sigma Y^2 = 5506$ and $\Sigma XY = 3467$. Obtain the line of regression of Y on X and estimate the supply when the price is 16 units. (7, 8)