NRT/KS/19/2062

Bachelor of Science (B.Sc.) Semester–II Examination
STATISTICS
(Descriptive Statistics—II)
Optional Paper—2

Time : Three Hours]   [Maximum Marks : 50

Note :— ALL questions are compulsory and carry equal marks.

1. (A) State the requisites of an ideal measure of central tendency. Define median and mode. Derive the formulae for median and mode of a grouped frequency distribution.   10

OR

(E) Explain the importance of weights and define various weighted means.

(F) Given two values x_1 and x_2 prove that A.M. $\geq$ G.M. $\geq$ H.M.

(G) For a grouped frequency distribution, explain how median and mode can be obtained graphically.

(H) Prove that sum of deviations of a set of values from their arithmetic means is zero.

$2.5 \times 4 = 10$

2. (A) Define mean deviation and quartile deviation stating their merits and demerits. State their formulae in case of a grouped frequency distribution. Show mean deviation about mean is independent of change of origin but not of scale.

(B) Define raw and central moments of order r. Explain the purpose of Sheppard's correction for moments. For Sheppard's correction to be effective, which conditions should be satisfied by frequency distribution ? State the corrected formulae for μ_2 and μ_3.   5+5

OR

(E) Discuss the effect of change of origin and scale on moments about origin.

(F) Show that minimum value of root mean square deviation is the standard deviation.

(G) Derive the formula for pooled variance of two sets of observations. State its extension for n sets.

(H) What is use of coefficient of dispersion ? State the formulae for coefficient of dispersion based on various measures of dispersion. $2.5 \times 4 = 10$

3. (A) Define quartile of a frequency distribution. Explain how they can be graphically located. Explain use of quartiles in studying skewness of frequency distribution. Define a coefficient of skewness based on quartiles. Derive its limits.   10

OR

(E) Draw a sketch of box plot. How can box-plot be used to study skewness of a distribution ? What are outliers ? How can these be detected using a box-plot ? How to ascertain Kurtosis with the help of β_2 ?

(F) What are deciles and percentiles ? State a formula for i^{th} decile ($i = 1, 2 \ldots 9$) and i^{th} percentile ($i = 1, 2 \ldots 99$). If first and third quartile of a frequency distribution are 30 and 75 with coefficient of skewness 0.6, then find the median for this frequency distribution.

5+5

4. (A) Explain the use of rank correlation coefficient. Derive the expression for Spearman's rank correlation coefficient in case of (i) no ties (ii) ties in the ranks. When does it attain extreme values ? Justify your answers. 10

OR

(E) Show that correlation coefficient is independent of change of origin and scale.

(F) Show that, if one of the regression coefficients is greater than unity then other one is less than unity.

(G) Derive an expression for a line of regression of y on x using principle of least squares.

(H) Obtain an expression for angle between two lines of regression. Interpret the cases $r = 0$, $r = +1$, $r = -1$ in relation with angle between two lines of regression. 2.5×4=10

5. Solve any **TEN** of the following :—

(A) Does simple harmonic mean give more weightage to small values or large values ? Justify your answer.

(B) Give a practical situation where geometric mean is an appropriate measure.

(C) Let arithmetic mean of a series of 10 observations be 3.3 and geometric mean be 2.9. If 'O' is added to this set of observations, obtain the arithmetic mean and geometric mean of new set of observations.

(D) If standard deviation of scores is zero then state whether every score is zero or every score is same.

(E) Define range and give its main drawback.

(F) Find third central moment of a distribution for which mean is 15, variance is 25, β_1 is 1.

(G) State the relation between Q_2, D_5 and P_{50}.

(H) For a perfectly symmetrical distribution $Q_1 = 24$, $Q_3 = 86$. Find the mean of the distribution.

(I) For a mesokurtic distribution if variance is 3 then what will be the fourth central moment μ_4 ?

(J) Define coefficient of determination and state its use.

(K) Can the slopes of two regression lines be opposite in sign ? Justify.

(L) If $r_{xy} = 0.8$ and $u = \dfrac{x-10}{4}$, $v = \dfrac{8-y}{5}$ state the value of r_{uv}. 1×10=10