NKT/KS/17/9378

Bachelor of Arts (B.A.) Part–I Semester–II Examination

STATISTICS

Optional Paper–2

Time : Three Hours] [Maximum Marks : 50

N.B. :— All questions are compulsory and carry equal marks.

1. (A) Define arithmetic mean. State its formula in case of a grouped frequency distribution. State the merits and demerits of arithmetic mean.

Show that :

(i) Sum of the deviations of observations from arithmetic mean is zero.

(ii) Sum of squares of deviations of observations from a constant A is minimum if A is arithmetic mean.

Also, derive the formula for pooled mean of two sets. 10

OR

(E) Derive the formula for calculating median of a grouped frequency distribution. Explain how median can be calculated graphically.

(F) Define Geometric Mean (G.M.). Write the formula for weighted G.M. Let G_1 be the GM of a set of n values $x_1, x_2, ..., x_n$ and let G_2 be the GM of a set of n values $y_1, y_2, ..., y_n$. Then, show that :

(i) Log G_1 = AM of (log x_1, log x_2, ..., log x_n) where AM is the arithmetic mean.

(ii) $\left[\text{GM of ratios } \left(\frac{x_i}{y_i}\right), i = 1, 2, ..., n\right] = \frac{G_1}{G_2}$. 5+5=10

2. (A) Define mean deviation and quartile deviation. Also, state the formula for mean deviation in case of a grouped frequency distribution. Give two conditions where mean deviation is not appropriate but quartile deviation is an appropriate measure of dispersion.

(B) Show that mean deviation is the least when measured from median. State the measures of relative dispersion based on mean deviation and quartile deviation. 5+5=10

OR

(E) Define variance of a set of values. State its formula for a grouped frequency distribution. Also, define standard deviation and coefficient of variation (CV). Explain the need and use of CV.

(F) Define raw and central moments of order r. Explain the purpose of Sheppard's corrections for moments. For Sheppard's corrections to be effective, which conditions should the frequency distribution satisfy ? 5+5=10

3. (A) Define quartiles, deciles and percentiles. State their formulae and also explain how Q_1 can be obtained from cumulative frequency diagram of less than type.

(B) Describe a box-plot. Explain its use in studying central tendency, dispersion and skewness of a frequency distribution. 5+5=10

OR

(E) Discuss Kurtosis and Skewness of a frequency distribution. 10

4. (A) Derive an equation to the line of regression of Y on x. Define a regression coefficient of Y on x (b_{yx}). Why are there two lines of regression ? Derive the angle between them and interpret the cases when r = 0 or ± 1. Suppose r = 0.8 then can b_{yx} be equal to – 1.6 ? Justify your answer. 10

OR

(E) Define Spearman's rank correlation. Derive its value in case of no tie. How are ranks calculated in case of ties ? Derive the formula for Spearman's rank correlation in case of ties. 10

5. Answer any **ten** of the following questions :

(A) If A, G and H denote the arithmetic mean, geometric mean and harmonic mean of two positive values, show that $AH = G^2$.

(B) State the formulae for weighted arithmetic mean and weighted harmonic mean.

(C) Find the arithmetic mean of first n natural numbers.

(D) State the formula for pooled variance of two groups of values.

(E) Show that variance is the smallest value of mean square deviation.

(F) Write the formula for μ_4 in terms of raw moments.

(G) What percentage of values falls between Q_1 and P_{55} ? Here Q_1 is the first quartile and P_{55} is the 55^{th} percentile ?

(H) Which quartile, decile and percentile are equal ?

(I) State the x-coordinate and y-coordinate of the point of intersection of two ogives.

(J) Define Kendall's correlation coefficient.

(K) Show that correlation coefficient is the geometric mean of regression coefficients.

(L) With reference to linear regression, show that the mean of predicted values is equal to the mean of observed values. 10×1=10