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H.P.A.S. (Main)—2011

STATISTICS

Paper I

Time : 3 *Hours* *Maximum Marks :* 150

Note :— Attempt Question No. 1 which is compulsory and any *four* questions from the rest, five in all. *All* questions carry equal marks.

1. (*a*) Define the probability of an event. When are two events called independent ?

   (*b*) Explain the method of calculation of the median value of a variable from a frequency distribution.

   (*c*) For the correlation coefficient $\gamma_{x,y}$ bewteen two variables, show that :

$$|\gamma_{x,y}| \leq 1.$$

P.T.O.

2. (a) For the events A, B, let $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{6}$ and $P(A \cup B) = \frac{1}{2}$. Calculate $P(B/A)$.

(b) A discrete variable has the distribution :

$$P(x) = P(X = x) = kx, \; x = 1, 2, 3, 4.$$

Find the values of k and $E(X)$.

3. (a) Define a Poisson distribution. Find its mean and variance.

(b) Obtain the moment generating function of a normal distribution.

4. (a) Compare the relative merits of the mean, median and mode of a frequency distribution.

(b) Define the kurtosis of a distribution. How is it measured by the coefficient β_2 ? Show that :

$$\beta_2 \geq 1.$$

5. (a) How is association between two attributes measured ? Illustrate by an example.

(b) Explain the rank correlation coefficient and derive an expression for it.

6. (a) Define orthogonal polynomials and mention its use.

(b) Define a χ^2-statistic and explain its use in testing the goodness of fit of a distribution to given data.

7. (a) Define the consistency and unbiasedness of an estimator. Illustrate by an example that a consistent estimator need not be unbiased.

(b) What are best unbiased linear estimators ? Give an example.

8. (a) Given a random sample $(x_1, x_2, ...,x_n)$ from a rectangular distribution :

$$f(x, \theta) = \frac{1}{b-a}; \; a \leq x \leq b$$

obtain the maximum likelihood etimators of 'a' and 'b'.

(b) Explain the method of moments for estimation of a parameter. Give an example.