RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2012

SECOND YEAR

Date : 18/12/2012 **Statistic (General)**

Time : 11am – 1pm Paper : III Full Marks : 50

1. Answer **any five** questions : (5×4)
   a) Define the concepts –parameter, statistic, sampling distribution.
   b) What do you mean by Unbiasedness of an estimator? Show, with an example, that unbiased estimator may not be unique.
   c) If $x_1, x_2, ..., x_n$ be a random sample from a Poisson distribution whose p.m.f. is

   $$f_\theta(x) = \begin{cases} \dfrac{e^{-\theta}\theta^x}{x!} & \text{if x = 0,1,2,...} \\ 0 & \text{otherwise} \end{cases}$$

   Find a sufficient estimators of θ.
   d) Illustrate with example the relation between acceptance of a null hypothesis and confidence interval of a parameter.
   e) What do you mean by minimum variance unbiased estimator. Give one example.
   f) Show that sample mean is a consistent estimator of population mean if n samples are drawn from a normal population with mean μ and variance σ^2.
   g) Distinguish between simple and composite hypothesis with suitable examples.
   h) Distinguish between level-α test and size-α test.
2. Answer **any three** questions : (3×10)
   a) Suppose X_1 and X_2 be mutually independent binomial variables with p.m.f. s (10)

   $$b(x_1; m_1, p) = \binom{m_1}{x_1} p^{x_1} q^{m_1 - x_1} \text{ for } x_1 = 0,1,....,m_1$$
   $$= 0 \text{ otherwise}$$

   And $$b(x_2; m_2, p) = \binom{m_2}{x_2} p^{x_2} q^{m_2 - x_2} \text{ for } x_2 = 0,1,....,m_2$$
   $$= 0 \text{ otherwise}$$

   Find the sampling distribution of $X_1 + X_2$.
   b) Show that sample mean and sample variance are independently distributed when a random sample of size n is drawn from a normal population with mean μ and variance σ^2. Also find the sampling distribution of sample mean. (8+2)
   c) Derive the maximum likelihood estimators of μ and σ^2 on the basis of a random sample of size n from a normal population with mean μ and variance σ^2. Check whether the estimator of σ^2 is unbiased. (7+3)
   d) What are non-parametric tests? Explain the two-sample Mann-Whitney and Wald-Wolfowitz run test, clearly indicating the nature of critical regions. (2+4+4)
   e) i) Give some examples of variance stabilizing transformations and their uses. (4)
   ii) Explain the use of Pearsonion Frequency Chi-Square in testing independence of two attributes. (6)
   f) Define the Pearsonian χ^2 statistic. Briefly state the uses of it. (10)

ജ❃ଓ