RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2011

SECOND YEAR

STATISTICS (General)

Date : 20/12/2011

Time : 11am – 1 pm

Paper : III

Full Marks : 50

1. Answer **any five** questions : 4×5 = 20
   a) If $X_1, X_2, \ldots\ldots\ X_n$ are random sample from $N(\mu,\sigma^2)$ population, obtain the distribution of sample mean $\bar{X}$. 4
   b) If $X \sim Bin(n, p)$ distribution, then find out an unbiased estimator of $p(1-p)$. 4
   c) Define consistency. State the sufficient condition for an estimator to be consistent. 4
   d) Distinguish between Point estimation & Interval estimation. 4
   e) Define Type–I error and Type–II error in context with the testing of statistical hypothesis. 4
   f) An urn contains 6 marbles of which θ are white and the others black. In order to test the null hypothesis $H_0:\theta=3$ against $H_1:\theta=4$, two marbles are drawn at random (without replacement) and H_0 is rejected if both the marbles are white. Find the probabilities of type I and type II error. 2+2
   g) Show that sample variance is a biased estimator of population variance in sampling from an infinite population. 4
   h) Obtain the confidence internal for differences in means of two independent normal populations when the variances are known. 4

2. Answer **any three** questions: 10x3 = 30
   a) Show that in sampling from normal population the sample mean and the sample variance are independently distributed. Find the sampling distributions. 5+5
   b) Describe the Pearsonian Chi-square test for homogeneity and independence of attributes. Find the simplified form of the test-statistic for 2x2 case. 6+4
   c) Derive the ML estimator of μ and σ^2 of a normal distribution. Check that the estimator of μ is unbiased and then find the standard error of the estimator. 10
   d) Suppose that we have two univariate normal distributions with known means μ_1, μ_2 and unknown variances σ_1^2, σ_2^2. Describe a procedure for testing the equality of the variances on the basis of independent samples.
      State briefly the modifications required if μ_1 & μ_2 are unknown. 7+3
   e) (i) Explain the following terms: (I) Critical region (II) Alternative hypothesis (III) p–value 2+2+2
      (ii) Derive the likelihood-ratio test for sample mean when variance is known. 4
   f) Find a $100(1-\alpha)\%$ confidence interval of μ on the basis of a random sample of size n taken from $N(\mu,\sigma^2)$ population when σ^2 is known. Also write down the modification required when σ^2 is unknown. 6+4

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