

**Avinashilingam Institute for Home Science and Higher Education for Women  
[Deemed to be University] Coimbatore-641 043**

**Bachelor's Degree Examination – November 2018  
III Semester**

**Class : II UG  
Major : Mathematics**

**Time: 3 hours  
Max. Marks: 100**

**15BMAC07 Inferential Statistics**

**Part-A**

**10 x 1=10**

**Choose the correct answer**

- Parameters are those constants which occur in
  - Samples
  - Probability Density Function
  - a formula
  - None of the above
- If an estimator  $T_n$  of population parameter  $\theta$  converges in probability to  $\theta$  as  $n \rightarrow \infty$  is said to be
  - Sufficient
  - Efficient
  - Consistent
  - Unbiased
- By the method of moments one can estimate
  - All the constants of the population
  - Only mean and variance of the distribution
  - All moments of a population distribution
  - All the above
- A maximum likelihood estimator may be consistent but not necessarily
  - Unbiased
  - Consistent
  - Efficient
  - Sufficient
- In 1933, the theory of testing of hypothesis was propounded by
  - R A Fisher
  - J Nyeman
  - E L Lehman
  - Karl Pearson
- Area of the critical region depends on
  - Size of type I error
  - Size of Type II error
  - Value of the statistic
  - Number of observations
- Test of hypothesis  $H_0: \mu = 70$  vs  $H_1: \mu > 70$  leads to
  - One-sided left-tailed test
  - One-sided right-tailed test
  - Two-tailed test
  - None of the above
- The standard error of mean of a random sample of size 'n' from a population with variance  $\sigma^2$  is -----
  - $\frac{\sigma}{\sqrt{n}}$
  - $\frac{\sigma^2}{\sqrt{n}}$
  - $\frac{\sigma}{n}$
  - $\frac{\sigma}{n^2}$
- The hypothesis that the population variance has a specified value can be tested by
  - t-test
  - Z-test
  - Chi-Square test
  - Z - test
- Degrees of freedom for Chi-square in case of contingency table of order ( 4 X 3) are:
  - 12
  - 9
  - 8
  - 6.

**Part B**

**5 X 6=30**

**Answer the following**

**Answer should not exceed 400 words or two pages**

- a) With an example show that unbiased estimator is not unique.  
(or)
- b) State the following :
  - Neyman Factorization theorem
  - Rao-Blackwell theorem
- a . Obtain the MLE for the parameter  $\lambda$  of Poisson distribution with sample of size 'n'  
(or)
- b. Bring out the properties of the MLE.

- 13.a. Describe the procedure to test the hypothesis of the given problem.  
(or)
- 13.b. With an example discuss about the types of errors
- 14.a. A sample of 400 managers is found to have a mean height of 171.38 cms. Can it be reasonably regarded a sample from a large population of mean height 171.17 cms and standard deviation of 3.30cms.  
(or)
- 14.b. A random sample of 12 families in our city showed an average weekly food expenditure of Rs 1380 with a s.d. of Rs 100 and a random sample of 15 families in another city showed an average monthly food expenditure of Rs 1320 with a s.d. of Rs 120. Test whether the difference between the two means is significant at a level of significance of 0.01.
- 15.a. State the conditions for the applications of Chi-square test.  
(or)
- 15.b. Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviation of their weights is 0.8 and 0.5 respectively. Assuming that the weight distribution are normal, Test the hypothesis that the true variances are equal, against the alternative that they are not, at the 10% level. (Assume that  $F_{10, 8, 0.01} = 3.35$ )

**Part C**

**5 x 12=60**

**Answer the following**

**Answer should not exceed 800 words or four pages**

- 16.a. Show that the sample median and sample variance is a consistent estimator for the population mean and population variance of a normal distribution.  
(or)
- 16.b. State and elaborate in detail about the characteristics of estimators.
- 17.a. Obtain the estimators of  $\mu$  and  $\sigma^2$  by the method of moments.  
(or)
- 17.b. Prove that the MLE of the parameter  $\alpha$  of the population having pdf  

$$f(x, \alpha) = \frac{2}{\alpha^2} (\alpha - x), \quad 0 < x < \alpha$$
for a sample of unit size is  $2x$ , being the sample value. Show also that the estimator is not unbiased.
- 18.a. If  $X \geq 1$  is the critical region for testing  $H_0 : \theta = 2$  against the alternative  $H_1 : \theta = 1$ , on the basis of the single observation from the population  $f(x, \theta) = \theta e^{-\theta x}$ ,  $0 < x < \infty$ .  
(or)
- 18.b. State and Prove Neyman Pearson Lemma with its significance.
- 19.a. Describe the procedure for testing the significance of a hypothesis with its assumptions.  
(or)
- 19.b. A random sample of 10 girls has the following IQ's: 70,120, 110,101, 88, 83, 95, 98, 107, 100. Do these data support the assumptions of a population mean IQ of 100?
- 20.a. Out of 8,000 graduates in a town 800 are females, out of 1,600 graduate employees 120 are females. Use Chi-square to determine if any distribution is made in appointment on the basis of sex. Value of Chi-square at 5% level for one degree of freedom is 3.84.  
(or)
- 20.b. Time taken by workers in performing a job are given below:
- |           |   |    |    |    |    |    |    |    |
|-----------|---|----|----|----|----|----|----|----|
| Method I  | : | 20 | 16 | 26 | 27 | 23 | 22 |    |
| Method II | : | 27 | 33 | 42 | 35 | 32 | 34 | 38 |
- Test whether there is any significant difference between the variances of time distribution.