D 51518 (Pages : 3) Name.................................

Reg. No...............................

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2013

(UG–CCSS)

Complementary Course—Statistics

ST 3C 03—STATISTICAL INFERENCE

Time : Three Hours Maximum : 30 Weightage

Part A

Answer **all** *questions.*

Each question carries ¼ weightage.

1. The mean of the Chi-square distribution with n d.f. is :

   (a) n. (b) $2n$.

   (c) $n-2$. (d) None of these.

2. If X follows N (0, 1) and Y follows a Chi-square with n degrees of freedom then $\frac{\sqrt{n}x}{\sqrt{y}}$ is distributed as :

   (a) Chi-square with n-1 degrees of freedom.

   (b) t-distribution with n-1 degrees of freedom.

   (c) t-distribution with n degrees of freedom.

   (d) Chi-square with n degrees of freedom.

3. Standard deviation of the sampling distribution of an estimator is called :

   (a) Sampling error. (b) Standard error.

   (c) Means square error. (d) None of these.

4. If t_n is consistent estimator of θ then as $n \to \infty$:

   (a) Var $(t_n) \to 0$. (b) Var $(t_n) = \theta$.

   (c) Var $(t_n) \to \infty$. (d) Var $(t_n) \to 0$.

5. If $X_1, X_2, ..., X_n$ is a random sample from a population $p^x (1-p)^{n-x}$ for $x = 0, 1$ and $0 < p < 1$, the sufficient statistics for p is :

   (a) $\sum_{i=1}^{n} X_i$. (b) $\prod_{i=1}^{n} X_i$.

   (c) Both (a) and (b). (d) None of these.

6. Fisher Neyman factorization criterion is used to obtain an estimator which is :

   (a) Consistent. (b) Unbiased.

   (c) Efficient. (d) Sufficient.

Turn over

7. Which of the following test is a test for goodness of fit :
   (a) t-test. (b) F-test.
   (c) Chi-square test. (d) All of the above.
8. For a fixed confidence co-efficient (1-α), the most preferred confidence interval for the parameter θ is one :
   (a) With shortest width. (b) With largest width.
   (c) With an average width. (d) None of these.
9. A hypothesis which completely specified the form of the distribution of the population is called :
   (a) Simple. (b) Composite.
   (c) Null. (d) None of these.
10. Level of significance is the probability of :
   (a) Type I error. (b) Type II error.
   (c) No error. (d) None of these.
11. Distribution of the test statistic used to test $H_0 : \sigma^2 = \sigma_0^2$, where σ^2 is the variance of a normal population with known mean :
   (a) Chi-square distribution with n-1 degrees of freedom.
   (b) Chi-square distribution with n degrees of freedom.
   (c) t distribution with n-1 degrees of freedom.
   (d) t distribution with n degrees of freedom.
12. The value of Chi-square statistic is zero if and only if :
   (a) $\sum_i O_i = \sum_i E_i$.
   (b) $O_i = E_i$ for all i.
   (c) E_i is large.

(12 × ¼ = 3 weightage)

Part B

Answer **all** *nine questions.*
Each question carries 1 *weightage.*

13. Define a t-statistics.
14. If $X_1, X_2, \ldots, X_n$ is a random sample from a normal population with mean μ and variance σ^2, obtain the distribution of $\frac{1}{n} \sum_{i=1}^{n} X_i$.
15. Distinguish between point estimation and interval estimation.
16. Define consistency of estimators.
17. Define the concept of efficiency.
18. If $X_1, X_2, \ldots, X_n$ is a random sample from a uniform distribution over $(0, \theta)$, obtain the moment estimator for θ.

19. Define type I and type II error.
20. Define power of a test.
21. Write down the test statistic used to test the equality of means of two normal populations, when the variances are known.

(9 × 1 = 9 weightage)

Part C

Answer any **five** *questions.*
Each question carries 2 weightage.

22. State the relation between the normal, Chi-square, t and F distributions.
23. State Fisher Neyman factorization criterion.
24. Describe maximum likelihood method of estimation.
25. Obtain a sufficient estimator for θ using a sample of size n from $f(x, \theta) = \frac{1}{\sqrt{2\pi\theta}} e^{-x^2/2\theta}$.
26. Obtain a 95 % confidence interval for the mean of a normal population when S.D. is known.
27. State Neyman-Pearson Lemma.
28. Describe paired sample t-test.

(5 × 2 = 10 weightage)

Part D

Answer any **two** *questions.*
Each question carries 4 weightage.

29. If $X_1, X_2, \ldots, X_n$ is a random sample from a normal population with mean μ and variance σ^2, obtain the distribution of sample mean and variance.
30. Let $X_1, X_2, \ldots, X_n$ is a random sample from a normal population with mean μ and variance σ^2, obtain the MLE's of μ and σ^2.
31. Explain the test procedure for test the equality of variances of two normal populations with known means.

(2 × 4 = 8 weightage)