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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, May 2021

First Degree Programme under CBCSS

Statistics

Complementary Course for Mathematics

ST 1431.1 : STATISTICAL INFERENCE

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

Use of Statistical table and scientific calculator are permitted.

PART – A (Problems / Very Short Answer Questions)

(Answer **all** questions, **one** mark each)

1. Define consistency.
2. What are the principles of experimental design?
3. Give an example for a statistic which is consistent but not unbiased?
4. Write the Confidence Interval for population variance.
5. The well known lemma used to find best critical region \_\_\_\_\_.

P.T.O.

6. Write confidence interval for testing equality of proportions.
7. Probability of accepting the null hypothesis actually it is false is \_\_\_\_\_.
8. Write the test statistic for testing equality of means of two populations.
9. Name the distribution which is used in Goodness of Fit.
10. The theorem underlying in large sample test is \_\_\_\_\_.

(10 × 1 = 10 Marks)

PART – B (Problems / Short Answer Questions)

Answer any **eight** questions. Each question carries **2** marks.

11. Explain Interval estimation.
12. State Fisher Neyman Factorization theorem.
13. What are the properties of MLE?
14. If  $t$  is a consistent estimator  $\theta$ , show that  $t^2$  is a consistent estimator of  $\theta^2$ .
15. Write down procedure for finding best critical region.
16. Write down the format for ANOVA table for two way ANOVA.
17. Define type 1 error and type 2 error.
18. Distinguish between one failed and two failed tests with suitable example.
19. Explain the paired sample t test.
20. Define Standard Error.

21. Define sufficiency. Give an example of a sufficient estimator of a given population parameter.
22. What are the sufficient conditions for a consistent estimator?
23. Give the statistic under the null hypothesis of testing of mean of a population has a specified value for large sample.
24. Given the sample statistics  $n_1 = 400$ ,  $\bar{x}_1 = 24.50$ ,  $S_1 = 2.5$ ,  $n_2 = 500$ ,  $\bar{x}_2 = 20$ ,  $S_2 = 2$ . Find the value of the test statistic to test  $H_0 : \mu_1 = \mu_2$  when  $\sigma_1^2 = \sigma_2^2$ .
25. Distinguish between simple and composite hypothesis. Give examples.
26. What are the assumptions underlying in ANOVA?

(8 × 2 = 16 Marks)

PART – C (Problems / Short Essays)

Answer any **six** questions. **Each** question carries **4** marks.

27. Find sufficient statistic for  $p$  of Binomial population.
28. Derive Confidence Interval for difference of means of Normal population.
29. Find MLE for the parameter involved in Poisson Distribution?
30. A sample of 400 observations were taken from a population with S.D. 15. If the mean of the sample is 27, test whether the hypothesis that the mean of the population is less than 24 at 5% level.

31. Derive the test statistic in 2x2 contingency table for testing the association between the attributes.

32. Two random samples 8 and 11 drawn from two normal populations are characterised as follows.

Sample Size	Sum of observation	Sum of Squares of observation
8	9.6	61.52
11	16.5	73.26

Examine whether the two samples came from populations having the same variance.

33. Obtain the moment estimator of  $\mu$  and  $\sigma$  based on  $n$  observations from  $N(\mu, \sigma^2)$ .

34. In Sampling from a normal population, examine whether the sample variance is an unbiased estimator of the population variance.

35. Find Power and Significance level for the following : if  $f(x) = 1/\theta, 0 < x < \theta$  the critical region is  $0.5 < x < 1$ ,  $H_0 : \theta = 1$  against  $H_1 : \theta = 2$ .

36. In a Sample of 400 men from city A 140 are diabetic patients, while in a sample of 320 men from city B, 95 are suffering from diabetes. Do the data indicate that the cities are significantly different with respect to the prevalence of Diabetes.

37. The following are the marks obtained by 10 students in a certain examination.

Marks : 43, 48, 65, 57, 31, 60, 37, 48, 78, 59

Test the hypothesis that population variance is 100.

38. Explain a contingency table using an example.

(6 × 4 = 24 Marks)



Part – D (Problem / Long Essays)

Answer any **two** questions. **Each** question carries **15** marks.

39. Explain the desirable properties of a good point estimator-with examples.
40. If 8.6, 7.9, 8.3, 6.4, 8.4, 9.8, 7.2, 7.8, 7.5 are the observed values of a random sample of size 9 from  $N(\mu, \sigma^2)$ . Derive and Estimate 95% confidence interval for  $\mu$  and  $\sigma^2$ .
41. What is meant by the test of statistical hypothesis? What are the principle steps involved in statistical test? Explain the procedure for testing equality of means and equality of proportions of a large populations.
42. The weight of 10 pigs was measured for the effects of the two foods referred to in the following table as food. A and food B From the data given below show that there is a significant difference between the effects of two foods, on the assumption that the pigs were of the same category and different category.

Pigs	1	2	3	4	5	6	7	8	9	10
Food A	7.7	11.6	10.2	11.2	8.1	9.4	12.7	5.8	10.4	12.5
Food B	11.9	10.8	11.1	13.1	10.1	14.4	15.5	11.6	14.6	13.6

43. The random sample were drawn from two normal populations and the following result were obtained

Sample I	16	17	18	19	20	21	22	24	26	27		
Sample II	19	22	23	25	26	28	29	30	31	32	35	36

Test whether the two populations have the same mean or not.

44. Discuss the importance of testing of hypothesis. How is it used to test the association between attributes? Evaluate chi-square for the following data.

Class	A	B	C	D	E
Observed frequency	8	29	44	15	4
Expected frequency	7	24	38	24	7

(2 × 15 = 30 Marks)

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