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(Pages 4)

G – 4074

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2019

First Degree Programme under CBCSS

Complementary Course For Mathematics

ST 1431.1 : TESTING OF HYPOTHESIS AND ANALYSIS OF VARIANCE

(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1 What is the error degrees of freedom for two way ANOVA with r rows and c columns?

2 Define level of significance of the test.

3 The mean difference between 9 paired observations is 15 and the standard deviation of differences is 5. Find the value of the test statistic.

4 Give one example of a statistic.

5 How will you find the correction factor in the calculation of sum of squares?

6 Define p value.

7 What test statistic will you use to test of a normal population with known mean?

8 Give the formula of F statistic.

9 Define critical region.

10 Give an instance where test for proportions is suitable?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. State Neyman Pearson lemma.

12. Define test statistic.

13. What are the assumptions of t – test?

14. A sample of 10 observations gives a mean equal to 38 and standard deviation 4. Can we conclude that the population mean is 40.

15. Define null and alternate hypothesis.

16. What are conditions for using Chi square for testing agreement between theoretical frequencies and observed frequencies?

17. The standard deviation of a sample of size 15 from a normal population was found to be 7. Examine whether the hypothesis that the S.D. is 7.6 is acceptable.

18. The daily consumption of diesel of a transporter is considered to be exponentially distributed. The hypothesis that the average consumption $H_0 : \theta = 1000$ litres/day is to be tested against $H_1 : \theta = 2000$. If the consumption on a randomly selected day is 1500 litres or more, H_0 is rejected. Find the size of the test.

19. Distinguish between large sample and small sample tests illustrating by suitable examples.

20. The following data was obtained in an investigation about the effect of vaccination for small pox.

	Vaccinated	Not vaccinated	Total
Attacked by small pox	3	12	15
Not attacked	8	5	13
Total	11	17	28

Examine whether vaccination is effective in preventing small pox.

21. From a population with unknown S.D, a sample of unknown size with mean and sample S.D. were found to be 195 and 50. A statistician has rejected the hypothesis at 5 % level significance that the mean of the population is 200. Find the sample size.

22. Explain the importance of normal distribution in large sample tests.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Given the frequency function

$$f(x, \theta) = \begin{cases} \frac{1}{\theta} & 0 \leq x \leq \theta \\ 0, & \text{elsewhere} \end{cases}$$

and that we are testing the null hypothesis $H_0: \theta = 1$ against the alternative $H_1: \theta = 2$ by means of a single observed values of x. What would be the probabilities of type 1 and type 2 errors, if we choose $0.5 \leq x$ as the critical region. Also find power.

24. Can the following two samples be regarded as coming from the same normal population?

Sample	Size	Sample mean	Sum of squares of deviation from the mean
1	10	12	120
2	12	15	314

25. State some applications of the analysis of variance.

26. When do you use paired t test and how to apply it?

27. Explain assignable causes and random causes with examples.

28. In a sample of 600 men from city A, 450 are found to be smokers. Out of 900 from city B, 450 are smokers. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking?

29. Explain Chi square test of independence of attributes.

30. A die is thrown 60 times and number of times the following faces were obtained.

Faces :	1	2	3	4	5	6
No. of times :	14	7	5	8	10	16

Can the die be regarded as fair?

31. A sample of size 8 from a normal population is 6, 8, 11, 5, 9, 11, 10, 12. Can such a sample be regarded as drawn from a population with mean 7 at 2 % level of significance?

(6 × 4 = 24 Marks)

SECTION D

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

32. (a) Distinguish between one way and two way classification models and explain the procedure followed for carrying out analysis of variance.

(b) A plastic manufacturer tests the tensile strength of different types of polythene material. A sample of three measurements is taken for each material type and data in pounds per square inch are as follows :

Type I	:	200	215	218
Type II	:	260	255	277
Type III	:	245	248	272

Determine if the mean tensile strength of the three different types of material differ significantly.

33. Fit a Poisson distribution to the following data and test the goodness of fit :

x :	0	1	2	3	4	5	6
f :	275	72	30	7	5	2	1

34. (a) Explain the test procedure for testing equality of variance.

(b) Two random samples drawn from two normal populations are

Sample I :	20	16	26	27	23	22	18	24	25	19		
Sample II :	27	33	42	35	32	34	38	28	41	43	30	37

Obtain estimates of the variances of the populations and test whether the two populations have the same variance.

35. The following data gives marks obtained by a sample of 10 students before and after a period of training. Assuming normality test whether the training was of any use.

Student No :	1	2	3	4	5	6	7	8	9	10
Before training :	91	95	81	83	76	88	89	97	88	92
After training :	79	101	85	88	81	92	90	99	97	87

(2 × 15 = 30 Marks)