(Pages : 6) **M – 1566**

Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, December 2021

First Degree Programme under CBCSS

Statistics

Core Course VII

ST 1543 : TESTING OF HYPOTHESIS

(2018 and 2019 Admission)

Time : 3 Hours Max. Marks : 80

(Use of Statistical table and Scientific Calculator are allowed)

SECTION – A

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

1. Define critical region.

2. What is a statistical test?

3. Define size of the test.

4. What is the degrees of freedom of χ^2 in case of 2 × 2 contingency table?

5. Define power function.

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

P.T.O.

7. Name the appropriate test to test $H_0 : \mu = \mu_0$ against $H_1 : \mu > \mu_0$ when the population is large and S.D is known.

8. If there are 10 symbols of two types, equal in number, give the maximum possible number of runs.

9. Define empirical distribution function.

10. When the number of treatments is 2 in Kruskal Wallis test, the test reduces to ________.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Distinguish between simple and composite hypothesis.

12. Define null and alternate hypothesis.

13. State the assumptions of small sample test for population mean.

14. What are the uses of chi-square tests?

15. Given the following eight sample values –4, –3, –3, 0, 3, 3, 4, 4. Find the value of student's *t* statistic for testing $H_0 : \mu = 0$.

16. A manufacturer claims that his items could not have a large variance. 18 of his items has a variance 0.033. Find the value of Chi square to test $H_0 : \sigma^2 = 1$.

17. Define uniformly most powerful test.

18. 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.

19. State Neyman Pearson lemma.

20. Explain the procedure for testing the significance of correlation coefficient.

21. If the observed and theoretical cumulative distribution functions are,

Observed c.d.f : 0.038, 0.066, 0.093, 0.177, 0.288, 0.316, 0.371

Theoretical cdf : 0.036, 0.042, 0.129, 0.159, 0.243, 0.275, 0.238

Find the value of K – S statistic.

22. Following are the yields of maize in q/ha recorded from an experiment and arranged in ascending order with median M = 20,

15.4, 16.4, 17.3, 18.2, 19.2, 20.9, 22.7, 23.6, 24.5

Test $H_0 : M = 20$ vs $H_1 : M \neq 20$ at $\alpha = 0.05$.

23. How Wilcoxen signed rank test differ from sign test?

24. How to resolve the problem of zero difference in sign test?

25. In what situations do we use nonparametric tests?

26. Define run.

(8 × 2 = 16 Marks)

SECTION – C

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

27. Explain the terms (i) errors of the first and second kind (ii) critical region (iii) power of the test.

28. If $X \geq 1$ is the critical region for testing $H_0 : \theta = 2$ against $H_1 : \theta = 1$ on the basis of a single observation from $f(x; \theta) = \theta e^{-\theta x}$, $x \geq 0$, obtain the probabilities of type 1 and type 2 errors.

29. A sample of 25 items were taken from a population with standard deviation 10 and the sample mean is found to be 65. Can it be regarded as a sample from a normal population with μ = 60.

30. How is the degrees of freedom of the Chi square for goodness of fit determined?

31. In tossing of a coin, let the probability of turning up a head p. The hypothesis are $H_0 : p = 0.4$ against $H_1 : p = 0.6$. H_0 is rejected if there are 5 or more heads in six tosses. Find the significance level of the test.

32. Suppose a random sample of size n is taken from the Poisson population with p.d.f

$$f(x) = \frac{e^{-\lambda}\lambda^x}{x!},\ x = 0, 1, 2, \ldots$$

Give the most powerful critical region of size α for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1 (\lambda_1 > \lambda_0)$.

33. It is claimed that more IAS selections are made from cities rather than rural places. On the basis of the following data do you uphold the claim?

	Selected	Not Selected
From Cities	500	200
From rural places	100	30

34. Explain likelihood ratio test.

35. Distinguish between large sample and small sample tests with examples.

36. Following is a sequence of heads (H) and tails (T) in tossing of a coin 14 times.
HTTHHHTHTTHHTH

Test whether the heads and tails occur in random order.

[Given : for α = 0.05, $r_L = 2$, $r_U = 12$]

37. Explain Median test.

38. Explain Kolmogrov — Smirnov test.

(6 × 4 = 24 Marks)

SECTION – D

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

39\. (a) Explain the large sample test for testing equality of two population means.

(b) Given in the usual notation :

$$n_1 = 400,\ \overline{x}_1 = 250,\ s_1 = 40$$
$$n_2 = 400,\ \overline{x}_2 = 220,\ s_1 = 55$$

Test whether the two samples have come from populations having the same mean.

40\. (a) Explain how the Chi square distribution may be used to test goodness of fit.

(b) Five dice were thrown 96 times and the number of times, at least one die showed an even number is given below :

No. of dice showing even number :	5	4	3	2	1	0
Frequency :	7	19	35	24	8	3

41\. (a) Explain how *t* test is used for paired comparison of differences of means.

(b) 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 :	91	95	81	83	76	88	89	97	88	92
After :	79	101	85	88	81	92	90	99	97	87

42. (a) Explain F test for equality of population variances.

(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.

43. Explain Ordinary sign test and Wilcoxon signed rank test.

44. Explain Mann Whitney test and Kruskal Wallis test.

(2 × 15 = 30 Marks)