23ITU419

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(Fourth Semester)

Branch – **INFORMATION TECHNOLOGY**

STATISTICS FOR INFORMATION TECHNOLOGY - II

Time: Three Hours | Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 What is systematic sampling?
(i) A sampling method where every n^{th} item in a population is selected
(ii) A sampling method where items are selected randomly from a population
(iii) A sampling method where items are selected based on convenience
(iv) A sampling method where only a specific group of individuals is selected

2 In a one-tailed test of significance, the critical region is located:
(i) Only in the left tail of the distribution
(ii) Only in the right tail of the distribution
(iii) In both tails of the distribution
(iv) Nowhere in the distribution

3 When will a Student's t-test used?
(i) Comparing means of more than two independent groups
(ii) Comparing means of two independent groups
(iii) Comparing variances of two independent groups
(iv) Comparing proportions of two independent groups

4 What does the F-statistic represent in one-way ANOVA?
(i) The difference between the means of all groups
(ii) The variability within each group
(iii) The ratio of the variability between groups to the variability within groups
(iv) The probability of observing the data if the null hypothesis is true

5 What is the primary application of the sign test?
(i) To compare means of two independent groups
(ii) To compare variances of two independent groups
(iii) To determine if a sample median differs from a known value
(iv) To test the equality of proportions in two independent groups

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Explain the concept of simple random sampling with replacement. How does it differ from sampling without replacement?

OR

b Outline quota sampling and discuss its significance in research.

7 a Show that Type I and Type II errors in the context of hypothesis testing.

OR

b In a sample of 400 parts inspected by a factory, the number of defective parts was found to be 30. The company, however, claimed that only 5% of their product is defective. Check whether their claim is correct or not. (Table Value of Z at 5% level of significance for right – tailed test is 1.645).

8 a State the assumptions underlying the Student's t-test.

OR

b A random sample of 10 boys had the following I.Q.'s 70, 120 ,110, 101, 88, 83, 95, 98, 107,100. Do these data support the assumption of a population mean I.Q. of 100? Find reasonable range in which most of the mean I.Q. values of samples of 10 boys lie. [Table value of t for 9 d.f at 5% level of significance is 2.26].

9 a Describe the application of ANOVA in research and provide an example to illustrate its usage.

OR

Cont...

Q.no 9 Cont...

b A fair die is thrown 264times and obtain the following results. Show that the die is biased or not [Given $\chi^2_{0.05} = 11.07$ for 5 d.f.]

No. of appeared on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

10 a Explain the concept of the sign test and its primary application in statistical analysis.

OR

b Bring out the steps involved in conducting a Mann-Whitney U test.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Compare the stratified random sampling when $Var(\overline{y_n})_R \geq Var(\overline{y_{st}})_P \geq Var(\overline{y_{st}})_{Ney}$.

OR

b Prove that $V(\overline{y_{sys}}) = \frac{k-1}{nk} S^2_{wst}[1+(n-1)\rho_{wst}]$.

12 a Examine the procedure for test of significance for difference in proportions.

OR

b Summaries your answer when, A mathematics test was given to 50 girls and 75 boys. The girls average grade is 76 with a S.D of 6. While boys average grade is 82 with a S.D. of 2. Test whether there is any significant difference between the performance of boys and girls.

13 a Discuss the procedure for student's t-test for difference of means.

OR

b Two random samples were drawn from two normal populations and their values are:

A	65	66	73	80	82	84	88	90	92		
B	64	66	74	78	82	85	87	92	93	95	97

Test whether the two populations have the same variance at the 5% level of significance. [Given: F=3.36 at 5% level for ν_1=10 and ν_2=8].

14 a To test the significance of variation in the retail prices of a commodity in three principal cities, Mumbai, Kolkata, and Delhi, four shops were chosen at random in each city and the prices who lack confidence in their mathematical ability observed in rupees were as follows:

Kanpur	15	7	11	13
Lucknow	14	10	10	6
Delhi	4	10	8	8

Do the data indicate that the prices in the three cities are significantly different? [The table value of $F_{0.05}$ for ν_1=2 and ν_2=9 is 4.26].

OR

b Justify your answer when 8000 graduates in a town 800 are females, out of 1600 graduate employees 120 are females. Use χ^2 to determine if any distinction is made in appointment on the basis of their gender. [Value of χ^2 at 5% level of significance for one degree of freedom is 3.84].

15 a The following problem is the data related to temperature in degrees in two places.
Place-I: 24, 32, 28, 40, 22, 24, 26, 32, 36, 38, 39, 40, 21, 23, 26, 29, 20, 22, 26, 27, 19.
Place-II: 16, 18, 19, 24, 23, 22, 26, 24, 28, 32,40, 36, 30, 31, 34, 26, 35, 36, 38, 40,41.
Test whether the two places have the same temperature by applying run test.

OR

b Three products received the following performance rating by a panel of 20 customers. Use the Kurskal-Wallis test to determine whether there is significant difference in the performance ratings for the product.

Product		
A	B	C
25	60	50
70	20	70
60	30	60
85	15	80
95	40	90
90	35	70
80		75

[Value of χ^2 at 5% level of significance for 2 degrees of freedom is 5.99].

END

Z-Z-Z END