Seat No. _____

HO-003-2014018

B. Sc. (Sem. IV) (W.E.F. 2019) Examination

April - 2023

Statistics - 401

(Statistical Methods - 4)

Faculty Code : 003
Subject Code : 2014018

Time : $2\frac{1}{2}$ Hours / Total Marks : **70**

Instructions : (1) All the five questions are compulsory.
(2) Each question carries 14 marks.
(3) Students can carry their own scientific calculator.
(4) Graphs and log table should be provided to students on demand.

1 (a) Give the answer of following question : **4**

(1) The idea of correlation was given by _____.

(2) The quantity r^2 is known as _____.

(3) If $r_{xy} = -1$, it means that there is a _____ correlation between X and Y.

(4) Correlation coefficient is a _____ number.

(b) Write any one : **2**

(1) Write the properties of correlation coefficient.

(2) Find coefficient of correlation from the following results:
Average of x = 10.5, Average of y =13.9, s.d. of x = 3.5, s.d. of y = 4.1, n = 10, $\Sigma xy = 1364$.

(c) Write any one : **3**

(1) The correlation coefficient for a sample drawn from a bivariate population is 0.6 and its Probable error is 0.05396. Find number of pairs of the sample. Also find the probable limits for the population correlation coefficient.

(2) The rank correlation coefficient between marks in statistics and mathematics of 10 students is 0.4. Later on it was discovered that the difference in ranks of a student was taken as 3 instead of 7. Find the correct value of the Correlation coefficient.

(d) Write any one : **5**

(1) The following data are obtained for two variables x and y :

$n = 30,\ \Sigma x = 120,\ \Sigma x^2 = 600,\ \Sigma y = 90,\ \Sigma y^2 = 250,$

$\Sigma xy = 356$

However later on it was observed that two pairs were wrongly taken as (8, 10) and (12, 7) instead of (8, 12) and (10, 8). Find the correct value of the correlation coefficient.

(2) Prove that $-1 \le r \le 1$.

2 (a) Give the answer of following question : **4**

(1) If the attributes A and B are independent, the relation between the frequencies (AB), $(A\beta)$, (αB) and $(\alpha\beta)$ of attributes is $(AB)(\alpha\beta) =$ _____.

(2) If Yule's coefficient $Q = -1$, the coefficient colligation $\gamma =$ _____.

(3) If the regression coefficient $b_{YX} > 1$, then b_{XY} _____.

(4) The regression coefficient b_{YX} is the _____ of the regression line.

(b) Write any one : **2**

(1) Find Yule's coefficient of association and interpret it from the following data:
$N = 2000$, $(A) = 800$, $(B) = 600$, $(A\beta) = 300$

(2) Explain types of association of attributes.

(c) Write any one : **3**

(1) The two regression lines are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ and $\sigma_x^2 = 12$ then find out $\bar{x}, \bar{y}, \sigma_y^2$ and r.

(2) Write the difference between correlation coefficient and regression coefficient.

(d) Write any one : **5**

(1) Explain why there are two lines of regression?

(2) Write and prove Properties of Regression coefficient.

3 (a) Give the answer of following question : **4**

(1) A hypothesis contrary to null hypothesis is known as _____ hypothesis.

(2) Rejecting H_0 when H_0 is true is _____ error.

(3) Level of significance lies between _____ and _____.

(4) The number of independent values in a set of values is known as _____ .

(b) Write any one : **2**

(1) A random sample of 400 items gave mean 4.45 and variance 4. Can the sample be regarded as drawn from a normal population with mean 4?

(2) Explain type I and type II error.

(c) Write any one : **3**

(1) The average life of 150 electric bulbs of a company A is 1400 hours with a S.D. of 120 hours while the average life of 200 electric bulbs of company B is 1200 hours with a S.D. of 80 hours. Is the difference the average lives of the bulbs significant?

(2) Write required steps : Test of significance of difference between two standard deviations for large sample

(d) Write any one : **5**

(1) In a large consignment of apples, 64 fruits out of sample of 400 fruits are found to be bad. Test the hypothesis that the population proportion of bad apples in the consignment is 20%?

(2) In a sample of 500 families of a city A, 30 families used a specific brand of detergent powder. In city B, 55 families used the same brand in a sample of 1000 families. Do the data prove that the use of this detergent is equal in the two cities?

4 (a) Give the answer of following question : **4**

(1) Chi-square curve is always _____ skewed.

(2) The mean of χ^2 distribution is the number of _____.

(3) t-distribution is _____ to x-axis.

(4) The formula for Fisher's transformation from r to Z is Z_r = _____.

(b) Write any one : **2**

(1) A sample of 4 observations from the normal population gave the following results, Test the hypothesis that the mean of the population is 2. Sum of all observations is 7 and sum of square of all the observations is 15.
[$t(0.05, 3) = 3.183$]

(2) The following is a random sample obtained from the normal population. Find 95% confidence limits for the mean of the population: 65, 72, 68, 71, 77, 61, 63, 69, 73, 71. [$t(0.05,9) = 2.26$]

(c) Write any one : **3**

(1) Samples of two types electric bulbs were tested for length of life and the following data were obtained. Test at 5% level where the difference in the sample means significant? [$t(0.05, 13) = 2.16$].

Sample	Number of units	Mean (in hours)	S.D. (in hours)
1	8	1134	35
2	7	1024	40

(2) The units produced by a plant are classified into four grades. The past performance of the plant shows that the respective proportions are 8: 4: 2:1: To check the run of the plant 600 parts were examined and classified as follows. Is there any evidence of a change in production standards?

Grade	First	Second	Third	Fourth	Total
Units	340	130	100	30	600

(d) Write any one : **5**

(1) The sales data of an item in six shops before and after a special promotion campaign are as under. Can the campaign be judged as success? Test at 5% level of significance? Sum of difference of value of after and before promotion =After promotion- Before promotion =18, and sum of square of difference = 94, with $t(0.05, 5) = 2.57$.

(2) For the 2 × 2 contingency table,

A	b
C	d

Prove that chi-square -test of independence gives

$$\chi^2 = \frac{N(ab-bc)^2}{(a+b)(b+d)(a+c)(c+d)}$$

where $N = a+b+c+d$

5 (a) Give the answer of following question : **4**

(1) F-Distribution cannot take _____ values.

(2) _____ is helpful for testing three or more variables.

(3) There are 2 parameters in F-Distribution v_1 and v_2. They are called _____ of F-Distribution.

(4) If both the variances are equal in F-ratio, the _____ of the variances will equal 1.

(b) Write any one : **2**

(1) Give difference between large sample test and small sample test.

(2) Write Properties of F-distribution.

(c) Write any one : **3**

(1) The following information is obtained for two samples drawn from normal populations.

Sample	Size	Mean	$\sum(x-\bar{x})^2$
I	10	15	90
II	12	44	108

Test hypothesis that the population variance are equal.

$\left[F_{(0.05;\,9.11)} = 2.90\right]$

(2) Explain ANOVA.

(d) Write any one : **5**

(1) The following yields were obtained by using three fertilizers in different plots. Test the hypothesis that there is no significant different between the fertilizers.

$\left[F_{(0.05;\,2,\,9)} = 4.26 \right]$.

Fertilizer	Yield			
A	1	4	3	3
B	6	5	4	2
C	7	3	5	6

(2) How do you calculate ANOVA. And also write assumptions of ANOVA.