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MBB-003-1014018

Seat No. _____

B. Sc. (Sem. IV) (CBCS) Examination

March / April - 2018

Statistics : S-401

(New Course)

Faculty Code : 003

Subject Code : 1014018

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

Instructions : (1) All questions carry equal marks.

(2) Students can use their own scientific calculator.

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

(1) If $r = 1$, the relation between b_{yx} and b_{xy} is _____.

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

(3) If $r_{xy} = 0$, it depicts _____ association.

(4) Pearson's formula for correlation coefficient r_{xy} = _____.

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

(1) Define : Correlation

(2) The rank correlation coefficient between ranks in Statistics and Mathematics of 10 students is 0.4. It was later on observed that the difference in ranks of one student was taken as 3 instead of 7. Find correct value of rank correlation coefficient.

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

(1) For 10 pairs of observations the following results are obtained. Find the correlation coefficient and coefficient of determination

$\bar{x} = 21$, $\bar{y} = 22$, $\sum xy = 4220$, variance of $x = 100$ and variance of $y = 144$.

(2) Prove that, correlation coefficient is independent of change of origin and scale.

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

(1) Prove that $-1 \leq r \leq 1$

(2) The following data are obtained for two variable x and y :

$n = 30$, $\sum x = 120$, $\sum x^2 = 600$, $\sum y = 90$, $\sum y^2 = 250$, $\sum xy = 356$.

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 (a) Give the answers of following questions : **4**

(1) The signature property in regression means that the signs of r, b_{yx} and b_{xy} are _____.

(2) If the regression coefficient $b_{yx} > 1$, then _____.

(3) The formula for probable error with usual notation _____.

(4) The relation between Yule's coefficient Q and coefficient of colligation y is _____.

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

(1) Prove that $r = \pm \sqrt{b_{yx} + b_{xy}}$

(2) Find number of pairs from the following data

$r = 0.5, \sum xy = 120, \sum x^2 = 90, S_y = 8$

The variables are measured from their respective means.

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

(1) If $\bar{x} = 30.4, \quad \bar{y} = 26.5, \quad S_x = 6.4, \quad S_y = 8.0, \quad r = 0.56$ find equations of regression lines.

(2) Prove that b_{yx}, b_{xy} and r have always same sign.

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

(1) Find the missing frequencies in the following data and test whether the data are consistent or not ?
$N = 290, (AB) = 40, (\alpha) = 100, (B) = 160$

(2) Tangent between two lines of regression y on x and x on y is 0.6. If standard deviation of y is two times more than standard deviation of x, find correlation coefficient between x and y from this information.

3 (a) Give the answers of following questions : **4**

(1) The test statistic for testing the significance of correlation coefficient r is _____.

(2) Type second error is more severe than type _____ error.

(3) Equality of two population variances can be tested by _____.

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

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

(1) Define : Null hypothesis.

(2) A sample of 4 observations from a normal population has the following results. $\sum xi = 7$ and $\sum xi^2 = 15$. Test the hypothesis that the mean of the population is 2.

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

(1) Write the statement of Central Limit theorem.

(2) Test the difference between two correlation coefficients for the following information

$n_1 = 19, n_2 = 28, \ r_1 = 0.50, \ r_2 = 0.65$

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

(1) Explain Type-I and Type-II errors.

(2) Two independent samples provided the following results :

Sample	Size	Mean	Sum of squares of deviations from their respective means
1	10	12	120
2	12	13	144

Can the two samples be regarded as drawn from the same normal population?

4 (a) Give the answers of following questions : 4

(1) The hypothesis which is under test for possible rejection is called _____ hypothesis.

(2) If β is the probability of type II error, the power of the test is _____.

(3) Level of significance lies between _____.

(4) Critical region is also known as _____.

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

(1) The mean of sample of size 400 is 82 and S.D. is 18. Find 95% confidence limits for population mean.

(2) Write the difference between large sample test and small sample test.

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

(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) Write required steps: Test of significance of difference between two sample proportions for large sample.

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

(1) Write required steps : Test of significance of a mean for large sample.

(2) In a sample of 500 families in 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 the detergent is equal in the two cities?

5 (a) Give the answers of following questions : **4**

(1) The value of χ^2-statistic depends on the difference between _____ and _____ frequencies.

(2) The value of Chi-square varies from _____.

(3) If the value of coefficient of contingency never attains the value _____

(4) The value of coefficient of contingency lies between _____.

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

(1) Define chi-square with its uses.

(2) A sample of size 10 from a normal population gave mean and s.d. as 5 and 6. Test the hypothesis that population s.d. is 8.

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

(1) Prove that for 2 × 2 contingence table

$$\aleph^2 = \frac{N(ad-bc)^2}{(a+b)(b+d)(a+c)(c+d)} \text{ where}$$

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

(2) Give limitation of chi-square test.

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

(1) For 2 × r contingence table prove that

$$\aleph^2 = \sum w_i (p_i - p)^2$$

where, $p_i = \frac{a_i}{n_i}$, $p = \frac{a}{n}$, $q_i = (1-p_i)$, $w_i = \frac{n_i}{pq}$, $q = \frac{b}{n}$

$q = 1 - p$

(2) For the $2 \times r$ contingency table, prove that

$$\aleph^2 = \sum_r \left[N_1 N_2 \frac{\left(\frac{a_{1r}}{N_1} - \frac{a_{2r}}{N_2} \right)^2}{\left(a_{1r} + a_{2r} \right)} \right]$$

where, a_{1r} and a_{2r} are the frequencies of r^{th} column N_1 and N_2 are the sum of the both rows.