



DO-003-001422

Seat No. _____

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

April / May – 2015

S-401 : Statistical Methods

Faculty Code : 003

Subject Code : 001422

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) Q. 1 carry 10 marks.
(2) Q No. 2 and 3 each carries 25 marks
(3) Write the answers of M.C.Q. in answer sheet
(4) Right side figures indicate marks of that question.

1 Multiple Choice Questions : 20

- (1) In a regression line y on x , the variable x is known as :
(A) Independent variable
(B) Regressor
(C) Explanatory variable
(D) All of these
- (2) The property that b_{xy} , b_{yx} and r have same signs, it is called
(A) Fundamental property
(B) Signature property
(C) Magnitude property
(D) None of these
- (3) The coordinates (\bar{x}, \bar{y}) satisfy the lines of regression of :
(A) Y on X
(B) X on Y
(C) both the regression lines
(D) None of the two regression lines
- (4) If $r = 0$, the angle between two lines of regression is :
(A) zero degree
(B) ninety degree
(C) sixty degree
(D) thirty degree

- (5) If $b_{yx} < 1$ then b_{xy} is :
- (A) less than 1
 - (B) greater than 1
 - (C) equal to 1
 - (D) equal to 0
- (6) Regression coefficient is independent of
- (A) Origin
 - (B) Scale
 - (C) Both origin and scale
 - (D) Neither origin nor scale
- (7) If $r = 1$, the relation between the two variables X and Y is :
- (A) Y is proportional to X
 - (B) Y is inversely proportional to X
 - (C) Y is equal X
 - (D) None of these
- (8) The geometric mean of the two regression coefficient b_{xy} and b_{yx} equals to
- (A) r
 - (B) r^2
 - (C) 1
 - (D) None of these
- (9) If two variables have the linear relationship $x+y=100$ the correlation will be :
- (A) -1
 - (B) $+1$
 - (C) 0.080
 - (D) 0.20
- (10) If $r=1$ then
- (A) $\text{cov}(x, y) < \sigma_x \sigma_y$
 - (B) $\text{cov}(x, y) > \sigma_x \sigma_y$
 - (C) $\text{cov}(x, y) = \sigma_x \sigma_y$
 - (D) None of these
- (11) Whether a test is one sided or two sided depends on :
- (A) Alternative hypothesis
 - (B) Composite hypothesis
 - (C) Null hypothesis
 - (D) Simple hypothesis

- (12) Power of a test is related to
- (A) type I error
 - (B) type II error
 - (C) type I and II errors both
 - (D) None of these
- (13) Level of significance is the probability of
- (A) type I error
 - (B) type II error
 - (C) not committing error
 - (D) None of these
- (14) The degrees of freedom for statistics t for paired t-test based on n pairs of observations is :
- (A) $2(n - 1)$
 - (B) $(n - 1)$
 - (C) $(2n - 1)$
 - (D) None of these
- (15) The hypothesis that the population variance has specified value can be tested by
- (A) F-test
 - (B) Z-test
 - (C) χ^2 -test
 - (D) None of these
- (16) The value of statistic χ^2 is zero if and only if
- (A) $\sum_i O_i = \sum_i E_i$
 - (B) $O_i = E_i$ for all i
 - (C) E_i is large
 - (D) All of these
- (17) The range of statistics χ^2 is
- (A) -1 to 1
 - (B) $-\infty$ to ∞
 - (C) 0 to ∞
 - (D) 0 to 1
- (18) Area of the critical region depends on
- (A) Size of type I error
 - (B) Size of type II error
 - (C) Value of the statistic
 - (D) Number of observations

(19) As per proportion method, if $\frac{(AB)}{(B)} > \frac{(A\beta)}{(\beta)}$ then A and B

are said to possess

- (A) Positive association
- (B) Negative association
- (C) No association
- (D) None of these

(20) Yue's coefficient of association Q always lies between _____ and _____.

- (A) $-1, +1$
- (B) $0, 1$
- (C) $-1, 0$
- (D) None of these

2 (a) Answer the following questions : (any three) **6**

- (1) Define : Correlation
- (2) Explain the meaning of Regression
- (3) Write the statement of central limit theorem.
- (4) Define : Parameter, Statistic
- (5) The correlation coefficient between two variables x and y is 0.48 and the covariance between them is 36 . If the variance of x is 16 , find standard deviation of y .
- (6) How many pairs of observations must be included in a sample in order that an observed correlation coefficient of value 0.42 , shall have a calculated value of t greater than 2.72 ?

(b) Answer the following questions : (any three) **9**

- (1) Explain method of scatter diagram for obtaining correlation.
- (2) Explain level of significance.
- (3) Write the difference between large sample test and small sample test.

- (4) Find Yule's coefficient of association from following data :

$$N = 170, (A) = 80, (\beta) = 120, (\alpha B) = 20.$$

- (5) Find number of pairs from the following data :

$$\gamma = 0.5, \Sigma xy = 120, \Sigma x^2 = 90, S_y = 8.$$

The variables are measured from their respective means.

- (6) A random sample of 27 pairs of observations from a normal population gave a correlation coefficient of 0.6. Is this significant of correlation in the population ?

$$[t_{(0.05, 25)} = 2.06]$$

- (c) Answer the following questions : (any two) 10

- (1) Prove that correlation coefficient is independent of change of origin and scale.
- (2) Explain types of association of attributes.

- (3) 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 $N = a+b+c+d$

- (4) The following data are obtained for two variables x and y

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

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.

- (5) Two sample size are 10 and 9; its mean are 16 and 15 respectively; where sum of square of its observations are 2920 and 2520 respectively. Test both samples are taken from same population. $[F_{(0.05, 7.9)} = 3.29]$

3 (a) Answer the following questions : (any three) 6

- (1) Define : Coefficient of correlation.
- (2) Define : Critical value
- (3) Define : Standard error of statistic
- (4) Explain sampling distribution of statistic
- (5) The probable error of the correlation coefficient of 16 pairs of values is 0.085. Find the value of the correlation coefficient.
- (6) Examine the nature of association between A and B from the data given below :

$$N = 240, (AB) = 5, (\alpha) = 200, (\beta) = 195$$

(b) Answer the following questions : (any three) 9

- (1) Why are two lines of regression ?
- (2) Write difference between Correlation Coefficient and Regression Coefficient.
- (3) Explain type I and type II error.
- (4) Write required steps of Large Sample test for test of significance of a mean.
- (5) The two regression lines are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ and $S_x^2 = 12$, Find \bar{x}, \bar{y}, S_y^2 and r .
- (6) A correlation coefficient of 0.72 is obtained from a sample of 29 pairs of observations. Can the sample be regarded as drawn from a bivariate normal population in which true correlation coefficient is 0.8 ?

(c) Answer the following question : (any two)

10

- (1) Prove that the coefficient of correlation r lies between -1 and $+1$.
- (2) For the $2 \times r$ contingency table prove that

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

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.

- (3) Write required steps of large sample test for test of significance of difference between two means.
- (4) Calculate correlation coefficient from the following data :

$$n = 10, \quad \Sigma x = 140, \quad \Sigma y = 150, \quad \Sigma (x-10)^2 = 180,$$

$$\Sigma (x-15)^2 = 215, \quad \Sigma (x-10)(y-15) = 60$$

- (5) Two random samples of sizes 9 and 7 respectively are drawn from two different populations. The means of the samples are 196.4 and 198.8 respectively. The sum of the squares of deviations from their respective means are 26.94 and 18.73. Test the hypothesis that population means are equal. [$t_{(0.05, 14)} = 2.145$].
