* A A T - 0 0 3 - 0 0 1 4 2 2 *

AAT-003-001422 Seat No. _____

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

April / May - 2016

Statistics : Paper - 401

(Statistical Methods)

(New Course)

Faculty Code : 001

Subject Code : 001422

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

Instructions : (1) Students have to write answers of MCQ in main answer sheet only.
(2) Students can use their own scientific calculater.
(3) Statistical tables can be provided to students on request.

1 Multiple Choice Question **(20)**

1. In a regression line of Y on X, the variable X is known as:
   a) independent variable
   b) regressor
   c) explanatory variable
   d) All of these

2. Regression equation is also named as:
   a) prediction equation
   b) estimating equation
   c) line of average relationship
   d) All of these

3. The property that b_{xy} and b_{yx} and r have same signs, it called:
   a) fundamental property
   b) signature property
   c) magnitude property
   d) none of these

4. If $b_{yx} > 1$ then b_{xy} is:
   a) less than 1
   b) greater than 1
   c) equal to 1
   d) equal to 0

5. 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

6. If $r = 1$, the angle between two lines of regression is:
   a) zero degree
   b) ninety degree
   c) sixty degree
   d) thirty degree

7. If the two lines of regression are coincident, the relation between the two regression coefficient is:
   a) $b_{yx} = b_{xy}$
   b) $b_{yx} \cdot b_{xy} = 1$
   c) $b_{yx} \leq b_{xy}$
   d) $b_{yx} = -b_{xy}$

8. If each value of X is divided by 4 and of Y is multiplied by 2, then b'_{YX} by coded values is
   a) same as b_{YX}
   b) twice of b_{YX}
   c) four times of b_{YX}
   d) eight times of b_{YX}

9. If the correlation coefficient between the variable X and Y is r, the correlation coefficient between X^2 and Y^2 is:
   a) r
   b) r^2
   c) 0
   d) 1

10. 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

11. If $r = 1$ then
    a) $Cov(X, Y) < \sigma_X \sigma_Y$
    b) $Cov(X, Y) > \sigma_X \sigma_Y$
    c) $Cov(X, Y) = \sigma_X \sigma_Y$
    d) None of these

12. For two attributes A and B if $(AB)(\alpha\beta) \neq (A\beta)(\alpha B)$ then A and $B$are said to be
    a) Positive association
    b) negative association
    c) independence of attributes
    d) either (a) or (b)

13. A hypothesis may be classified as:
a) Simple
b) Alternative
c) Null
d) All of these

14. Level of significance is the probability of:
a) type I error
b) type II error
c) types I and II errors both
d) None of these

15. The value of statistic $\aleph^2$ 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

16. Test of hypothesis $H_0: \mu = 70 \, against \, H_1: \mu < 70$ leads to:
a) one side left tailed test
b) one sided right tailed test
c) two-tailed test
d) None of these

17. The degrees of freedom for statistic-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

18. The hypothesis that the population variance has specified value can be tested by:
a) $F - test$
b) $Z - test$
c) $\aleph^2 - test$
d) None of these

19. To test a hypothesis about proportions of items in a class, the usual test is:
a) $F - test$
b) $t - test$
c) $Z - test$
d) None of these

20. A wrong decision about H_0 leads to:
a) one kind of error
b) two kinds of error
c) three kinds of error
d) four kinds of error

2 (A) Give the answer (Any three) **(6)**

1. Write any two properties of regression coefficient.
2. Define: Parameter, Statistic
3. Write the statement of Law of large number
4. Define: Critical Value
5. Find coefficient of correlation from following data:

$$\bar{x} = 10.5, \bar{y} = 13.9, S_x = 3.5, S_y = 4.1, n = 10, \sum xy = 1364$$

6. Find the missing frequencies in the following data and test whether the data are consistent or not

$(A) = 300, (\alpha) = 200, (B) = 350, (AB) = 225$

(B) Give the answer (Any three) **(9)**

1. Explain Scatter diagram method.
2. Explain Critical Region.
3. Write require steps: Test of significance of Single proportion for large sample.
4. Write the properties of t-test.
5. For two variables, $r = 0.8$ and the probable error of r is 0.08. Find the number of pairs of observation.
6. The rank correlation coefficient for 10 pairs is 0.3. Later on it was found that the difference in ranks of one pair was misread as 9 instead of 6. Find correct value of rank correlation coefficient.

(C) Give the answer (Any three) **(10)**

1. Prove that, correlation coefficient is independent of change of origin and scale.

2. Write short note : Standard error of statistics

3. Prove that for 2×2 contingence table

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

4. The following data are obtained for two variable x and y :

$$n = 25, \sum x = 125, \sum x^2 = 650, \sum y = 100,$$
$$\sum y^2 = 460, \sum xy = 508$$

On subsequent verification it was found that two pairs (8,12) and (6,8) were wrongly taken as (6,14) and (8,6). Find the correct value of the correlation coefficient.

5. Two independent random samples of size 10 and 12 respectively are giving the information that, The means of the samples are 12 and 13 respectively. The sum of the squares of deviations from their respective means is 120 and 144. Test the hypothesis that population variance are equal.

3 (A) Give the answer (Any three) **(6)**

1. Define: Probable Error of correlation coefficient.

2. Prove that $r = \pm\sqrt{b_{yx} \times b_{xy}}$

3. Define: Null hypothesis

4. Write the statement of Central Limit theorem

5. Find the regression line using the data given below and hence estimate x for $y = 30$

$$n = 9, \bar{x} = 30, \bar{y} = 40, \sum (x - \bar{x})^2 = 120,$$
$$\sum (y - \bar{y})^2 = 346, \sum (x - \bar{x})(y - \bar{y}) = 193$$

6. A sample of 400 articles from a big lot gave 40 defective articles. Find 99.73% confidence limits of the percentage of defective articles in the entire lot.

(B) Give the answer (Any three) **(9)**

1. Explain coefficient of determination.

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

3. Explain Sampling Distribution of Statistics.

4. Find Spearman's rank correlation coefficient from the following data

x	23	20	25	26	24	25	20	18
y	11	13	15	13	9	10	11	8

5. The regression equation of two variables are $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$. Find $\bar{x}, \bar{y}, b_{yx}, b_{xy}$ and r.

6. A sample of size 20 drawn from a normal population gave mean and standard deviation as 42 and 6 respectively. Test the hypothesis that population standard deviation is 9.

(C) Give the answer (Any three) **(10)**

1. Prove that $-1 \leq r \leq 1$

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

3. Explain Type-I and Type-II error.

4. For $2 \times r$ contingence table Prove that, $\aleph^2 = \sum w_i(p_i - p)^2$

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

5. A random sample of 25 pairs of observations from a bivariate normal population gave a correlation coefficient of 0.55. On the basis of sample we can say that population coefficient of correlation is 0.62?