

3. The table given below gives marks obtained by 8 students in Economics and Statistics respectively :-

Marks in Economics	Marks in Statistics
15	40
20	30
28	50
12	30
40	20
60	10
20	30
80	60

Compute rank correlation coefficient between the marks obtained in two subjects.

4. The following information is available for twenty pairs (X, Y) of observations :

$$\bar{X} = 15, \bar{Y} = 20, \sigma_x = 4, \sigma_y = 5 \text{ and } \text{Corr. } (X, Y) = 0.3$$

At the time of above computations one pair of observation (27, 30) was wrongly taken as (17, 35). Find correct coefficient of correlation.

5. What do you understand by the principle of least squares in regression analysis ? Also state properties of regression coefficients.
6. Explain the concept of partial correlation coefficient. If $r_{12} = 0.8$, $r_{13} = -0.4$ and $r_{23} = -0.56$. find $r_{23.1}$.

Section II

7. State and prove Chebychev's inequality.
8. Let X have the pdf, $f(x) = \frac{1}{2\sqrt{3}}$, $-\sqrt{3} \leq x \leq \sqrt{3}$. Find the actual probability $P\left(|X - \mu| \geq \frac{3}{2}\sigma\right)$ and compare it with the upper bound obtained by Chebychev's inequality.
9. Define the smallest order statistics $X_{(1)}$. Let X_1, X_2, \dots, X_n be i.i.d. geometric random variables each with parameter 'p' that is $P(X_i = x) = q^{x-1}p$, $x = 1, 2, 3, \dots, q = 1 - p \forall i$. Show that smallest order statistics $X_{(1)}$ also has a geometric distribution with parameter $1 - q^n$.
10. Explain the concept of sampling distribution and standard error by taking a sample of size two without replacement, from a hypothetical population having four units as 2, 3, 5 and 6.

11. The random variable X representing the number of Cherry puffs has the following probability distribution :

x	$P(X = x)$
4	0.2
5	0.4
6	0.3
7	0.1

Find :

- (i) μ_x
 - (ii) σ_x^2
 - (iii) $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}^2$ for a random sample of size 36 Cherry puffs from the above probability distribution.
 - (iv) Find the probability that average number of Cherries in 36 Cherry puffs will be less than 5.5.
12. The mean score for freshmen on an aptitude test at a certain college is 540, with standard deviation of 50. What is the probability that two groups of students selected at random consisting of 32 and 50 students respectively, will differ in their mean scores by more than 20 points ?

Section - III

13. Explain the following :
- Type I error
 - Type II error
 - Power of the test
 - Level of significance.
14. The machine is supposed to mix peanuts, hazelnuts, cashews and pecans in the ratio 5 : 2 : 2 : 1. A can consisting of 500 of these mixed nuts was found to have 269 peanuts, 112 hazelnuts, 74 cashews and 45 pecans. Test the hypothesis at 0.05 level of significance that machine is mixing the nuts in the ratio 5 : 2 : 2 : 1.
15. A random sample of 200 married men, all retired were classified according to education and number of children :

Education	Number of Children		
	0—1	2—3	Over 3
Elementary	14	37	32
Secondary	19	42	17
College	12	17	10

Test the hypothesis that the size of a family is independent of the level of education attained by the father.

(6)

16. A study was conducted where two different waste water plants A and B are compared. The amount of waste water treated at each plant was randomly sampled for 10 days. The data are as follows :

Plant A	Plant B
21	20
19	39
20	24
23	33
22	30
28	28
32	30
19	22
13	33
18	24

Can we conclude that the average amount of water treated at plant B is more than that from A ? Assume $\alpha = 0.05$ and data appears from two independent normal populations.

17. A social worker believes that fewer than 25% of the couples in a certain area ever used any form of birth control. A random sample of 120 couples was conducted. Twenty of them said that they had used some method of birth control. Comment on social workers belief using $\alpha = 0.01$.
18. A taxi company manager is trying to decide whether the use of radial tyres instead of regular belted tyres improves fuel economy. Ten cars were equipped with radial tyres and driven over prescribed test course. Without changing drivers, the same were then equipped with regular belted tyres and driven again over the test course. The gasoline consumption in k.ms.Liters were recorded as follows :

Car	Radial Tyre	Belted Tyre
1	4.2	4.1
2	4.7	4.9
3	6.6	6.2
4	7.0	6.9
5	6.7	6.8
6	4.5	4.4

ks 75

to above

deviations

between

P.T.O.

P.T.O.

7	5.7	5.7
8	6.0	5.8
9	7.4	6.9
10	4.9	4.7

Can we conclude that cars equipped with radial tyres give better fuel economy than those equipped with belted tyres. Assume that populations to be independent normally distributed. Use $\alpha = 0.05$. Also consider P-value in your conclusion.