

**POST GRADUATE DIPLOMA IN
APPLIED STATISTICS (PGDAST)**

Term-End Examination

December, 2018

01772

MST-004 : STATISTICAL INFERENCE

Time : 3 hours

Maximum Marks : 50

Note :

- (i) *Attempt all questions. Questions no. 2 to 5 have internal choices.*
 - (ii) *Use of scientific calculator is allowed.*
 - (iii) *Use of Formulae and Statistical Tables Booklet for PGDAST is allowed.*
 - (iv) *Symbols have their usual meaning.*
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1. State whether the following statements are *True* or *False*. Give reasons in support of your answers. $5 \times 2 = 10$

- (a) The variance of t-distribution with 20 degrees of freedom will be 1.

- (b) If T_1 and T_2 are two estimators of a parameter θ such that $\text{Var}(T_1) = \frac{1}{2n}$ and $\text{Var}(T_2) = \frac{2}{n}$, then T_1 is more efficient than T_2 .
- (c) If the probability of non-rejection of H_0 when H_1 is true is 0.3, then the power of the test will be 0.7.
- (d) The number of runs in the sequence ABBAABABABAA is 9.
- (e) The tabulated value of F-variate, for which the area on the right tail (α) = 0.99 and the degrees of freedom, $\nu_1 = 5$ and $\nu_2 = 10$, is 5.64.

2. The number of mobile phones in five families is as follows :

2, 4, 3, 1, 5.

If we select a sample of size 2 without replacement,

- (a) How many samples are possible ? Write them down.

- (b) Compute the mean of all samples and set up the sampling distribution of the sample mean.
- (c) Compute the mean and standard error of the sampling distribution of the sample mean. 3+4+3

OR

The weight of certain type of boxes has a variance of 11 pound². A random sample of 20 boxes is selected :

- (a) What is the sampling distribution of the sample variance ?
- (b) What is the probability that the variance of this sample is greater than or equal to 16 pounds² ?
- (c) Also, calculate the mean and variance of the sampling distribution of the sample variance. 1+7+2
3. Obtain the maximum likelihood estimate of θ for the population whose pdf is given by $f(x, \theta) = (1 + \theta) x^\theta$; $0 < x < 1$ based on an independent sample of size five : 2, 3, 1, 4 and 5. Also examine whether this estimate is sufficient for θ . 6+4

OR

- (a) The weights (in kgs) of 10 randomly chosen workers are :

48, 50, 62, 75, 80, 60, 70, 56, 52 and 77.

Obtain the 95% confidence interval for the variance of the weights of all workers.

- (b) Write the properties of a good estimator.

Explain any one of them.

8+2

4. In a year, there were 956 births in town A, of which 52.5% were males, while in towns A and B combined, this proportion in a total of 1406 births was 0.496. Is there any significant difference in the proportions of male births in the two towns, at 5% level of significance ?

10

OR

An experiment was conducted to find out whether a new animal food product increases the weight. Eight animals were selected and given the new animal food. The following results show the weights (in kg) of the animals before and after using new food :

	Animal No.	1	2	3	4	5	6	7	8
Weight	Before	49	53	51	52	47	50	52	53
	After	52	55	52	53	50	54	54	53

If it is known that weights of the animals before and after the new food follow the normal distribution, answer the following :

- (i) Are both samples paired or independent ?
- (ii) State the null and alternative hypothesis.
- (iii) Which test is used for testing the null hypothesis and why ?
- (iv) Conduct the suitable test at 5% level of significance and interpret the result. $1+1+2+6$

5. A company randomly assigned the employees to three different groups to train them in a certain inspection procedure by three different methods. At the end of the training, they were tested. The scores of the employees are given below :

Method A : 80 83 79 85 90 68

Method B : 82 84 60 72 86 67 91

Method C : 93 65 77 78 88

Test that the median scores due to three methods are same at 5% level of significance. 10

OR

1000 families were selected at random in a city to test whether the high income families usually send their children to public schools and the low income families often send their children to government schools. The following results were obtained :

	School	
Income	Public	Government
Low	370	430
High	130	70

Test whether income and type of schooling are independent at 5% level of significance.

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