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MST-004

Post Graduate Diploma in Applied Statistics (PGDAST)

Term-End Examination

June, 2020

MST-004 : STATISTICAL INFERENCE

Time : 3 Hours *Maximum Marks : 50*

Note : *Question No. 1 is compulsory. Attempt any* ***four*** *questions from the remaining Question Nos. 2 to 7. Use of scientific (non-programmable) calculator is allowed. Use of formulae and statistical tables booklet for PGDAST is allowed. Symbols have their usual meanings.*

P. T. O.

1. State whether the following statements are True or False. Give reasons in support of your answers : 2×5=10

(a) If the probability density function of a random variable X, which follows χ^2-distribution, is $f(x)=\frac{1}{2}e^{-\frac{x}{2}}$; $0<x<\infty$, then the degrees of freedom of the distribution will be 1.

(b) A sufficient estimator is not necessarily a consistent estimator.

(c) For testing $H_0:\theta=1$ against $H_1:\theta=2$, the p.d.f. of the variable is given by :

$$f(x,\theta)=\begin{cases}\frac{1}{\theta}, & 0\le x\le\theta\\ 0; & \text{otherwise}\end{cases}.$$

If the critical region is $X\ge 0.4$, the size of the test will be 0.6.

(d) If a sequence of Heads and Tails in tossing a coin 20 times is :

HHHTTTHTHTHHTHTTHHHH,

then the number of runs in this sequence will be 11.

(e) The number of samples of size 2 without replacement from a population of size 5 will be 25.

2. (a) The monthly wages (in thousand rupees) of 5 workers are as follows :

3, 5, 7, 7, 8

(i) How many samples of size 3 are possible without replacement ? Write them. 2

(ii) Compute the mean of all samples (considered in part (a)) of size 3 and set up the sampling distribution of the sample mean. 4

(b) Suppose the average salary of the employees in an organization is ₹ 60,000 and standard deviation is ₹ 24,000. If a

sample of 36 employees is selected at random, find the probability that the employees having average salary between ₹ 50,000 and 65,000. 4

3. The following data give the weights of the employees working in two different departments of a company :

Department I	Department II
61	60
66	65
67	71
85	74
78	76
63	82
85	85
86	87
88	
91	

Construct 95% confidence interval for ratio of population variances. 10

4. (a) The weekly sales of the ten stores before and after the sales campaign are given in the following table :

Store No.	Without Sales Campaign	With Sales Campaign
1	65	67
2	54	59
3	81	80
4	39	47
5	92	97
6	41	40
7	52	57
8	69	75
9	89	94
10	58	64

Assuming sales of the stores follow normal distribution, is the sales campaign increased the sales of the stores at 1% level of significance. 7

(b) Write at least *two* differences between large sample test and small sample test, with *one* example of each. 3

5. The following data shows the sales of a small retail store (in thousand rupees) for eight years. Use $\alpha = 0.05$ to determine whether data fit a uniform distribution : 10

Year	Sales
1	55
2	50
3	53
4	60
5	65
6	62
7	55
8	52

6. (a) The working hours of Bank A are from 10 a. m. to 3.30 p. m. and the working hours of Bank B are from 8.00 a. m. to 8.00 p. m. A random sample of

40 employees was selected from Bank A and 10 out of them have indicated high stress level. Similarily, a random sample of 50 employees from Bank B was selected and 22 out of them were found in high stress.

Does this indicate that the stress levels of employees of Bank B are significantly higher by considering 99% as confidence level. 7

(b) Differentiate between parametric and non-parametric tests. 3

7. (a) Let $X_1, X_2, \ldots, X_n$ be a random sample from $\text{Bin}(r, \theta)$ population with r known and $0 \leq \theta \leq 1$.

Find the MLE of θ. 6

(b) Describe the properties and applications of Chi-square test. 4