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MST–004

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

December, 2025

MST-004 : STATISTICAL INFERENCE

Time : 3 Hours *Maximum Marks : 50*

Note : *(i) Question No. **1** is compulsory.*

*(ii) Attempt any **four** questions from the remaining questions.*

(iii) Use of scientific (non-programmable) calculator is allowed.

(iv) Use of Formulae and Statistical Tables Booklet of PGDAST is allowed.

(v) Symbols have their usual meanings.

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

(a) If estimators T_1 and T_2 of a parameter θ have variances $\frac{1}{2}$ and $\frac{1}{4}$ respectively, then T_1 is more efficient and T_2.

(b) If you observed the *p*-value as 0.02, for testing :

$H_0 : \mu = 50$ km/litre

$H_1 : \mu < 50$ km/litre

at 5% level of significance, then the null hypothesis will be rejected.

(c) If a random variable X follows F-distribution with pdf :

$$f(x) = \frac{1}{(1+x)^2}; \quad 0 < x < \infty$$

then the degrees of freedom of the distribution will be (2, 2).

(d) The paired *t*-test is used when population is not normal.

(e) Non-paramatric tests are more powerful than the paramatric tests.

2. The following data represents the number of days the employees of a small company were absent : 10

Employee	No. of Days Absent
A	25
B	20
C	30
D	20
E	22

On the basis of the data :

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

(ii) Compute the mean of all samples obtained in part (i) and set up the sampling distribution of mean.

(iii) Compute mean and standard error of the sampling distribution obtained in part (ii).

3. An ambulance agency claims that the average service time is 10 minutes with SD 3 minutes. A research suspects that this claim is wrong. She takes a random sample of 20 services of the ambulance and finds the average service time is 12 minutes with a SD 5 minutes. Assuming that the service time of the ambulance follows normal distribution : 10

(i) What is the probability that the average service time is less than 12 minutes ?

(ii) Find 95% confidence interval for SD of the average service time.

4. (a) A coal-fired power plant is considering two different systems for pollution abatement. The first system (system A) has reduced the emission of pollutants

to acceptable levels 68 out of 100. The second more expensive system, (system B) has reduced the emission of pollutants to acceptable levels 86 out of 120. If system B is more effective than A, then management of the power plant will install the system B.

Now : 8

(i) State null and alternative hypothesis.

(ii) Write name of the test which is suitable in this situation and why ?

(iii) Calculate the value of the test statistic and critical value.

(iv) Which system will be installed if management uses a significance level 0.01 in making decision ?

(b) Define Type I error with example. 2

5. (a) A cricket coach has developed a new technique of bowling a reverse swing.

To determine how well this method works, the coach selected two teams, say, Team A and Team B, of 12 players in each team. Each player of Team A was asked to bowl 60 balls using the old technique while each player of Team B by the new technique. The number of successful attempts of each player of Team A and Team B are given in the following table :

Team A	Team B
40	45
30	60
55	50
35	60
40	35
40	50
30	55
40	60

50	50
45	50
40	40
35	55

Assuming the normality and other assumptions, examine whether the average successful attempts by team B is great than that of Team A at 1% level of significance. 7

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

6. If magnitude of earthquake recorded in a region of a country follows a distribution with parameter θ whose pdf is given as follows :

$$f(x) = \frac{1}{\theta^2} xe^{-x/\theta}; \; x > 0, \theta > 0.$$

compute maximum likelihood and moment estimators for parameter θ. Also compare them. 10

7. (a) In a locality, 1000 persons were randomly selected and asked about their educational achievements. The information recorded is as follows :

Gender	Education		
	Middle	High School	College
Male	120	130	250
Female	220	130	150

Can we say that education is associated with gender at 5% level of significance ? 7

(b) Differentiate between estimator and estimate by giving an example. 3

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