

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

Term-End Examination

MST-005 : Statistical Techniques

Time : 3 Hours]

[Maximum Marks : 50

Note: Attempt all questions. Question no. 2 to 5 have interval choices. Use of scientific calculator is allowed is allowed. Use of formulae and statistical tables Booklet for PGDAST is allowed. Symbols have their usual meanings.

1. State whether the following statements are true or false. Give reasons in support of your answers:
- $5 \times 2 = 10$
- (a) The selection of cricket team for the World cup is an example of simple random sampling.
- (b) In a cluster sampling, the elements within a cluster should be as homogeneous as possible.
- (c) In one-way ANOVA, the amount of total variation that is unexplained is measured by the treatment sum of squares.



- (d) It there are two missing values in a randomised block design with 3 blocks and 4 treatments, the error degrees of freedom will be 4. For a random number 0.6 from uniform [0,1] distribution, exponential random number with $\alpha = 4$ will be 0.1277.
2. The data given below pertain to the total geographical area in 20 villages of a block. Treating this as population of 20 units, stratify this population into three strata taking stratum sizes to be villages with geographical area 50 hectares (ha) or less, villages with area in between 60 and 100 ha and villages having area more than 100 ha . A random of 6 villages is to be selected by taking 2 villages from each stratum.

Geographical Area (in ha) of 20 villages

20	80	50	100	150	70	20	250
220	10	50	140	80	20	50	30
70	90	100	220				

Compute the variances of sample mean for stratified random sampling as well as corresponding unstratified simple random sampling.

3. The average number of units produced per day by each of the four production methods are given below:

Method-I	Method-II	Method-III	Method-IV
18	19	17	16
16	18	18	15
17	19	19	17
18	17	19	
17		16	

At $\alpha = 0.05$ level of significance, is there any significant difference among the four production methods. 10

4. An experiment was conducted to investigate the effect of your different diets (A,B,C and D) an milk production (in litres) of 4 cows. During each lactation period, the cows received different diets. Assume that there is a washout period between diets so that previous diet does not effect future results. The data are given below:

Period	Cow number			
	1	2	3	4
1	(A)31	(B)38	(C)41	(D)40
2	(B)32	(C)37	(D)34	(A)30
3	(C)35	(D)Y	(A)37	(B)32
4	(D)33	(A)35	(B)35	(C)32

Estimate the missing value (Y) and analyse the given data at 1% level of significance. 10

5. In a particular city, the daily consumption of electricity (in, Giga watt hours) follows

approximately Gamma distribution (n, α) with $n=4$ and $\alpha = \frac{1}{2}$. Using the first fourteen uniform random numbers $U(0, 1)$ generated from linear congruential generator $x_i = (17x_{i-1} + 3) \text{ mode } 16$ with $x_0 = 3$, generate daily consumption of electricity for three days. 10

6. (a) The medical records of 30 patients are arranged in serial numbers 1 to 30 select all possible systematic random samples of 10 records.
- (b) Describe some application of simulation. 4
7. Following are the yields (in kilograms) per plot that resulted when all four combinations of 2 levels of nitrogen (N) and 2 levels of phosphate (P) were applied to a grain variety in a randomized block experiment:

Block	Yield			
I	(1)	(n)	(p)	(np)
	4.3	6.5	6.4	8.8
II	(p)	(1)	(n)	(np)
	8	4.7	9.3	8
III	(1)	(n)	(np)	(p)
	5.5	7.9	8.2	6.4
(IV)	(np)	(n)	(p)	(1)
	4.8	6.3	5.4	5.5

Perform analysis of variance on above data at and draw conclusions. 10