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MST-005

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

Term-End Examination, 2019

MST-005 : STATISTICAL TECHNIQUES

Time : 3 Hours]

[Maximum Marks : 50

Note : Question No. 1 is compulsory. Answer any four questions from the remaining questions. Use of scientific calculators (non-programmable no. 2 to 7) 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 reason in support of your answers : [2x5=10]

(a) Three Pseudo Random Numbers (PRN) using Linear Congruential Generator (LCG) Method :

$$x_i = (37945x_{i-1} + 932) \bmod (10^4) \text{ are}$$

$$x_1 = 3187, x_2 = 1647, x_3 = 6347 \text{ and } x_4 = 7947$$

where $x_0 = 359$.

- (b) In an examination hall, there are 20 rows and each row has 30 students. A research scholar selects 4 rows randomly and then includes all the students of these selected in his study rows. The research scholar is using two stage sampling technique.
- (c) Possible number of samples of size 10 drawn from a population of size 1000 if sampling is done with replacement will be : $1000C_{10}$.
- (d) In a factorial experiment having 3 factors each at 7 levels requires 343 combinations.
- (e) In a study null hypothesis is

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$$

After applying ANOVA, we reach at the conclusion that H_0 is rejected. It always means that :

$$\mu_1 \neq \mu_2, \mu_2 \neq \mu_3, \mu_3 \neq \mu_4, \mu_4 \neq \mu_5$$

2. (a) Explain the procedure of selecting a sample from a population using systematic sampling technique. Write the units of your sample if a systematic random sample of 10000 people

from a population of 10,00,000 is drawn under the information that first randomly selected unit is 47. [5]

- (b) To determine the yield rate of the rice in a district, 5 groups were constructed of 5 plots each.

The data are given in the following table :

Plot No.	Group 1	Group 2	Group 3	Group 4	Group 5
1	10	8	17	14	15
2	12	5	15	8	12
3	9	12	20	6	17
4	20	18	18	10	8
5	8	6	25	16	10

Select a cluster sample of 3 clusters from the given data and find the sample mean. [5]

3. A manufacturer wishes to determine the effectiveness of four types of machines (A, B, C and D) in the production of bolts. To accumulate this, the numbers of defective bolts produced for each of two shifts in the results are shown in the following table :

Machine	First shift					Second shift				
	M	T	W	Th	F	M	T	W	Th	F
A	6	4	5	5	4	5	7	4	6	8
B	10	8	7	7	9	7	9	12	8	8
C	7	5	6	5	9	9	7	5	4	6
D	8	4	6	5	5	5	7	9	7	10

Perform an analysis of variance to determine at 5% level of significance, whether there is a difference :

(a) Between the machines and

(b) Between the shifts [10]

4. Estimate the missing value in the following LSD and then carry out the analysis of variance test : [10]

Column \ Row	I	II	III	IV
I	A ₈	C 18	B 11	D 8
II	C ₁₆	B10	D7	A Y
III	B ₁₂	D10	A6	C20
IV	D ₁₀	A 9	C28	B 16

5. The following table gives the grouped data for number of items demanded per day. They were generated by Poisson distribution algorithm with mean $\lambda = 6$. By using

Chi-square test for goodness of fit, test the hypothesis that the generated data fit the Poisson distribution with $\lambda = 6$: [10]

Demand (x) :	3	4	5	6	7	8-9	10
Frequency (n _j) :	12	10	12	18	10	20	5

6. (a) Draw all possible samples of size 2 from the population {8, 12, 20} and verify that $E(\bar{x}) = \bar{X}$ and find variance of the estimate of the population mean. [6]

(b) Using five uniform random variables

$$U_1 = 0.316, U_2 = 0.087, U_3 = 0.270, U_4 = 0.129, U_5 = 0.249$$

generate a Binomial random variable $B(n, p)$, with $n = 5$ and $p = 0.2$. [4]

7. (a) Explain layout of RBD design. [4]

(b) Explain sampling and non-sampling error. [4]

(c) Explain purposive sampling. [2]

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