　　　　MST-005

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

June, 2022

MST-005 : STATISTICAL TECHNIQUES

Time : 3 hours　　　　　*Maximum Marks : 50*

Note : Question no. ***1*** *is* ***compulsory****. Answer any* ***four*** *questions from the remaining questions no. 2 to 7. Use of scientific calculator (non-programmable) 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. *5×2=10*

   (a) If a fair coin is tossed six times and in all the six trials the coin turned up tail, then the statement "In the next trial, the coin turned up head because of law of large numbers" is true.

(b) Suppose U_1, U_2, U_3, ..., U_N be N population units. If $N = 1000$, then the probability of selecting U_{100} at 10th draw is $\dfrac{1}{1000}$, where sampling scheme is SRSWOR.

(c) Systematic sampling is always recommended when the sampling frame has a periodic frame.

(d) Homoscedastic assumption in ANOVA refers to mutually uncorrelatedness of the random variables y_{ij}, where y_{ij} represents outcome of the response variable Y.

(e) The Middle Square method of generating random numbers always gives required number random number irrespective of starting point.

2. (a) Suppose that three units 2, 3, 4 constitute a population. If the sampling scheme used is SRSWOR, verify that $E(\overline{x}) = \overline{X}$, $E(s^2) = S^2$. Also find variance of $\overline{x}$. *6*

(b) A sample of 100 employees is to be drawn from a population of colleges A and B. The population means and population mean squares of their monthly wages are given below :

College	N_i	$\overline{X}_i$	S_i^2
College A	300	25	25
College B	200	50	100

Determine the sample size using proportional and Neyman allocation technique and compare. *4*

3. An experiment was conducted to determine the effect of different months of planting and different methods of planting on a field of sugarcane. The data given below shows the yields of sugarcane for four different months and methods of planting :

Method of Planting	Months of Planting			
	October	November	February	March
I	7·10	3·69	4·70	1·90
II	10·29	4·79	4·50	2·64
III	8·30	3·58	4·90	1·80

Carry out an analysis of the above data at 5% level of significance. *10*

4. In the following data, one value is missing. Estimate this value and analyse the given data : *10*

Row \ Column	I	II	III	IV	Row Totals
I	A 12	C 19	B 10	D 8	49
II	C 18	B 12	D 6	A 7	43
III	B 22	D y	A 5	C 21	48+y
IV	D 12	A 7	C 27	B 17	63
Column Totals	64	38+y	48	53	203 + y

5. (a) Twenty uniform U(0, 1) numbers (x) generated by a generator are given as follows :

x	Rank (r_i)	x	Rank (r_i)	x	Rank (r_i)
0·867	17	0·442	10	0·408	8
0·778	15	0·273	6	0·681	13
0·741	14	0·140	4	0·144	5
0·480	11	0·968	19		
0·441	9	0·786	16	0·978	20
0·095	2	0·019	1	0·889	18
0·096	3	0·330	7	0·579	12

Demonstrate Kolmogorov-Smirnov test on these numbers and interpret the results. *8*

(b) Write two advantages and two disadvantages of simulation. *2*

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6. (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 108 people from a population of 1000 is drawn. *6*

(b) Write four differences between Probability and Non-probability sampling with examples. *4*

7. Write short notes on the following with examples : *10*

(a) Randomisation

(b) Factorial Experiments

(c) Two-stage Sampling

(d) Cluster Sampling

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