Seat No : _____

TC-21

Statistical Techniques (Paper-V)

Time : 3 Hours] **[Total Marks : 70**

Mk[Lkk : (1) s{ýe çkksLkk yf Ëhf «§Lkk øký Ëþkð A.

(2) MkkË økýLkÞºk ík{s ykfzkþk†eÞ fküfk ðkÃkhðkLke Ax A.

1. (a) rLkËþLk yx÷ þ ? rLkËþLkLke sYh þk {kx Ãkz A? yf Mkkhk rLkËþ™Lke ÷kûkrýfíkkyk sýkðk. **7**

(b) «[r÷ík Mkfíkk{k Mkkrçkík fhk f : Ãkhðýe hrníkLkk Mkh¤ ÞkáåA rLkËþLk {kx : **7**

$$V(\bar{y}) = \frac{N-n}{N} \quad \frac{S^2}{n}$$

yÚkðk

1. (a) Míkrhík ÞáåA rLkËþLk {kx «[r÷ík Mkfíkk{k Mkkrçkík fhk f : **7**

$$V(\bar{y}_{st}) = \frac{1}{N^2}\sum_{h=1}^{l} N_h(N_h - n_h)\frac{S_h^2}{n_h}$$

(b) ò 1, 5, 8, 12, 15 yLk 19 y yf Mk{rüLkk yð÷kfLkk nkÞ íkk ík{kÚke Ãkhðýe hneíkLkk fË “2” Lkk þõÞ nkÞ íkx÷k çkÄks Mkh¤ ÞáåA rLkËþLkk {¤ðk yLk Lke[Lkk Ãkrhýk{k [fkMkk : **7**

(1) $E(\bar{y}) = \bar{Y}$

(2) $E(s^2) = S^2$

(3) $V(\bar{y}) = \left(\frac{1}{n} - \frac{1}{N}\right)S^2$

2. (a) Mkh¾ ykÞksLkLke Mk{MÞkLk ÔÞkÃkf YÃk ykÃkk ík{s ÔÞkÏÞk ykÃkk : **7**

(1) Wf÷

(2) þõÞ Wf÷

(3) Eüík{ þõÞ Wf÷

(b) Lke[Lkk Mkh¾ ykÞksLkLkk «§ økkVLke heíkÚke {¤ðk :
Lke[Lke þhíkkLk ykÄeLk **7**

$$Z = 5x_1 + 3x_2 \text{ Lk } \{n¥k\{ \text{ çkLkkðk}$$

S. to $x_1 + 2x_2 \leq 52$

$2x_1 + 3x_2 \quad 84$

$x_1, x_2 \quad 0$

yÚkðk

2. (a) îî yx÷ þ? Mkh¾ ykÞksLkLkk «§{k ík fE heík WÃkÞkøke A? **7**

(b) Lke[Lkk Mkh¾ ykÞksLkLkk «§Lkk îî {¤ðe íkLkk MkeBÃk÷ûkLke heíkÚke Wf÷ {¤ðk:
Lke[Lke þhíkkLk ykÄeLk **7**

$$Z = 2x_1 + 2x_2 \text{ Lk LÞLkík\{ çkLkkðk :}$$

S.to $2x_1 + 4x_2 \quad 1$

$x_1 + 2x_2 \quad 1$

$2x_1 + x_2 \quad 1$

$x_1, x_2 \quad 0$

3. (a) yf rLkËþLk ÞksLkk rðMíkkhÚke Mk{òðk. **7**

(b) Lke[Lke rî-rLkËþLk ÞksLkkLke Mk{síke ykÃkk: **7**

N = 2000, n_1 = 50, c_1 = 0, n_2 = 100, C_2 = 2

ò p′ = 0.005, nkÞ íkk ÃkkÞMkLk rðíkhýLkk WÃkÞkøk fheLk

(1) MðefríkLke Mk¼kðLkk (P_a)

(2) AOQ {¤ðk ßÞk

ÃkÞMkLk rðíkhýLke Mk[Þe Mk¼kðLkkyk Lke[{sçk A :

	0	1	2
0.25	0.779	0.974	0.998
0.50	0.607	0.910	0.986

yÚkðk

3. (a) rî-rLkËþLk ÞksLkk {kx Lke[Lkk ÃkËk Mk{òðk: **8**
(1) AOQ (2) AOQL (3) ASN (4) ATI

(b) 2200 ðMíkykLkk yf sÚk{kÚke 225 ðMíkykLkk yf rLkËþ ÷ðk{k ykð A. ò sÚk{k 14 yÚkðk íkLkkÚke ykAe ¾k{eðk¤e ðMíkyk nkÞ íkk sÚkLkk Mðefkh fhðk{k ykð A Lkn^a íkk íkLkk yMðefkh fhðk{k ykð A. íkk OC, ATI yLk AOQ ð¢k Ëkhk yLk AOQL Lke f^{a}ík Ãký {¤ðk. **6**

4. (a) yf-økýÄ{eÞ ðøkefhýLke heík rðMíkkhÚke Mk{òðk. **7**

(b) Lke[Lke ÷rxLk [khMk ÞksLkkLk ÃkÚk¬hý fhk. **7**

A 12	C 19	B 10	D 8
C 18	B 12	D 6	A 7
B 22	D 10	A 5	C 21
D 12	A 7	C 27	B 17

yÚkðk

4. (a) rî-økýÄ{eÞ વર્ગીકરણની heík rðMíkkhÚke Mk{òðk. **7**

(b) Lke[Lke MkÃký ÞáåA ÞksLkkLk ÃkÚk¬hý fhk : **7**

	WÃkò				
{kðsíkk	1	2	3	4	5
A	55	49	42	21	52
B	61	112	30	89	63
C	42	97	81	95	92
D	169	137	169	85	154

5. (a) sÚÚkk rLkÞºký yx÷ þ? íkLkk ÷k¼k yLk økh÷k¼k ðýðk. EOQ Lke ÔÞkÏÞk ykÃkk. **7**

(b) yf fÃkLkeLke yf ðMíkLke ðkŠ»kf {køk 9000 yf{k A. Ëhf yf{Lke WíÃkkËLk ®f{ík ३.10 A. ðhËe {fðkLke ®f{ík ३. 8 A yLk sÚÚkk Äkhý ¾[yf{ ËeX 1 ३ધ્યો A ík{s ðhËe {¤ððkLke ®f{ík ३.18 A. íkk Eüík{ ¾heË sÚÚkk {¤ðk. f÷ LÞLkík{ ¾[þ Úkþ ík Ãký {¤ðk. **7**

yÚkðk

5. (a) sÚÚkk rLkÞºkýLke Mk{MÞk MkkÚk Mkf¤kÞ÷k rðrðÄ ¾[kyk Mk{òðk. **7**

(b) n»k÷ fÃkLke ðkŠ»kf 50,000 yf{k yf ðMíkLkk ðkÃkh A sLke WíÃkkËLk fª{ík ३.20 yf{ ËeX A. ðhËe {fðkLkk ¾[३.100 A yLk sÚÚkk Äkhý ¾[sÚÚkkLke ®f{íkLkk 15% A. EOQ þkÄk. **7**

Seat No : _____

TC-21

Statistical Techniques (Paper-V)

Time : 3 Hours] **[Total Marks : 70**

Instructions : (1) Figures to the right indicate marks of each question.

(2) Use of simple calculator and statistical tables is allowed.

1. (a) What is sampling? Why do you need sampling? What are the characteristics of a good sample? **7**

(b) In usual notations prove that for SRSWOR, **7**

$$V(\bar{y}_{st}) = \frac{1}{N^2}\sum_{h=1}^{l} N_h(N_h - n_h)\frac{S_h^2}{n_h} \quad \text{in usual notations.} \qquad V(\bar{y}) = \frac{N-n}{N}\frac{S^2}{n}$$

OR

1. (a) For stratified random sampling prove that **7**

(b) If 1, 5, 8, 12, 15 and 19 are the observations of a population, form all possible samples of size "2" units without replacement and verify the following results : **7**

(1) $E(\bar{y}) = \bar{Y}$

(2) $E(s^2) = S^2$

(3) $V(\bar{y}) = \left(\frac{1}{n} - \frac{1}{N}\right)S^2$

2. (a) Define a linear programming problem in its general form. Also define **7**

(1) a solution

(2) a feasible solution

(3) an optimum solution for such a problem.

(b) Solve the following linear programming problem by graphical method : **7**

Maximize : $Z = 5x_1 + 3x_2$

S. to $x_1 + 2x_2 \leq 52$

$2x_1 + 3x_2 \quad 84$

$x_1, x_2 \quad 0$

OR

2. (a) What is Duality? How is it useful in solving a Linear Programming problem ? **7**

(b) Convert the following Linear Programming problem into its dual and then solve it by Simplex method : **7**

Minimize : $Z = 2x_1 + 2x_2$

S. to $2x_1 + 4x_2 \quad 1$

$x_1 + 2x_2 \quad 1$

$2x_1 + x_2 \quad 1$

$x_1, x_2 \quad 0$

3. (a) Explain in detail Single Sampling plan. **7**

(b) Interpret the following Double Sampling plan : **7**

$N = 2000,\ n_1 = 50,\ c_1 = 0,\ n_2 = 100,\ C_2 = 2$

If $p' = 0.005$, then using Poisson distribution, calculate :
(1) Probability of acceptance (P_a)

(2) AOQ

Cumulative Probability of Poisson distributions :

	0	1	2
0.25	0.779	0.974	0.998
0.50	0.607	0.910	0.986

OR

3. (a) Explain the following terms for a Double Sampling plan : **8**

(1) AOQ (2) AOQL (3) ASN (4) ATI

(b) From a lot of 2200 items, a sample of size 225 is taken. If it contains 14 or less defectives, the lot is accepted, otherwise it is rejected. Plot the OC, ATI and AOQ curves. Also obtain the value of AOQL. **6**

4. (a) Explain in detail the technique of One-way classification. **7**

(b) Analyse the following Latin Square Design. **7**

A 12	C 19	B 10	D 8
C 18	B 12	D 6	A 7
B 22	D 10	A 5	C 21
D 12	A 7	C 27	B 17

OR

4. (a) Explain in detail two-way classification. **7**

(b) Analyse the following completely Randomised Design : **7**

	Yields				
Treatments	1	2	3	4	5
A	55	49	42	21	52
B	61	112	30	89	63
C	42	97	81	95	92
D	169	137	169	85	154

5. (a) What is inventory control? What are its advantages and disadvantages? Define EOQ. **7**

(b) A product of a company has an annual demand of 9000 units. The unit manufacturing cost is Rs.10. The cost of placing an order is Rs.8 and inventory carrying cost is Re.1 per unit, whereas cost of receiving an order from outside is Rs.18. Find optimum purchase quantity. What will be the total minimum cost? **7**

OR

5. (a) Explain in detail the various costs associated with an inventory control problem. **7**

(b) A Harshal company uses annually 50,000 units whose cost price is Rs.20 per unit. Cost of placing an order is Rs.100 and inventory carrying costs are 15% of the value per unit. Find EOQ. **7**