

2007

STATISTICS - II (Optional)

100041

Standard : Degree

Total Marks : 200

Nature : Conventional

Duration : 3 Hours

Note :

- (i) Answers must be written in **English** only.
- (ii) Question No. 1 is **Compulsory**. Of the remaining questions, attempt **any four** selecting one question from **each** section.
- (iii) Figures to the **RIGHT** indicate marks of the respective question.
- (iv) Use of log table, Non-Programmable calculator is permitted, but any other Table/Code/Reference book are not permitted.
- (v) Make suitable assumptions, wherever be necessary and state the same.
- (vi) Number of optional questions upto the prescribed number in the order in which they have been solved will only be assessed. Excess answers will not be assessed.
- (vii) Credit will be given for orderly, concise and effective writing.
- (viii) Candidate should not write roll number, any name (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he/she will be penalised.

1. Answer **any four** of the following (10 Marks each) :

- (a) Define canonical and standard form of linear programming problem. **10**
- (b) Explain the operating characteristics curve. **10**
- (c) Three varieties A, B and C of a crop are tested in a randomised block design within four replications. The plot yield in pounds are as follows. **10**

A	6	C	5	A	8	B	9
C	8	A	4	B	6	C	9
B	7	B	6	C	10	A	6

Analyse the experimental yield and state your conclusion.

- (d) What is a time series ? Explain the components of time series. **10**
- (e) Write a short note on two person zero-sum game. **10**

**P.T.O.**

## SECTION - A

2. Answer the following sub-questions :

(a) Using graphical method solve the L.P.P. 10

$$\text{Maximize } z = 5x + 10y$$

$$\text{Subject to } 5x + 8y \leq 40$$

$$3x + y \leq 12$$

$$x \geq 0, y \geq 0.$$

(b) Explain the North-West corner rule and hence solve the following transportation problem. 15

	D1	D2	D3	D4	Availability ↓
01	6	4	1	5	14
02	8	9	2	7	16
03	4	3	6	2	5
Requirements	6	10	15	4	35

(c) What is simulation technique ? Explain the advantages and disadvantages of simulation technique. 15

3. Answer the following sub-questions :

(a) Using simplex method solve the L.P.P. 10

$$\text{Maximize } z = 3x_1 + 4x_2$$

$$\text{Subject to } x_1 + x_2 \leq 450$$

$$2x_1 + x_2 \leq 600$$

$$x_1, x_2 \geq 0.$$

(b) Explain the Assignment Algorithm and hence determine the optimum assignment schedule. 15

		Jobs				
Persons	1	2	3	4	5	
A	8	4	2	6	1	
B	0	9	5	5	4	
C	3	8	9	2	6	
D	4	3	1	0	3	
E	9	5	8	9	5	

- (c) What do you mean by generation of random observations ? Determine the random observations from the following discrete distribution. 15

$x$	0	1	2	3
$p(x)$	0.4	0.3	0.2	0.1

## SECTION - B

4. Answer the following sub-questions :

- (a) Draw the mean chart and find out whether the production process is in control or not. 10

Sample	Weight			
1	10	12	10	12
2	10	12	13	13
3	10	10	9	11
4	11	10	9	14
5	12	12	12	12

- (b) (i) Distinguish between process control and product control. 5  
(ii) What do you understand by single sampling plan. 5
- (c) State and explain the process capability indices. 10
- (d) State and explain the concept of reliability. 10

5. Answer the following sub-questions :

- (a) The following table gives the inspection data to 10 samples of 100 items each, concerning the production of bottle corks. 10

Sample No.	1	2	3	4	5	6	7	8	9	10
Size of Sample	100	100	100	100	100	100	100	100	100	100
No. of defectives	5	3	3	6	5	6	8	10	10	4

Construct P chart.

- (b) (i) What is a control chart ? 5  
(ii) Write short note on Double sampling plan. 5
- (c) Explain the terms  $C_p$ ,  $C_{pk}$  and  $C_{pm}$ . 10
- (d) Explain the reliability of series and parallel system. 10

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## SECTION - C

6. Answer the following sub-questions :

- (a) (i) What is Latin Square Design ? 5  
 (ii) What is a factorial experiment ? 5
- (b) State and explain the analysis of variance for Balanced Incomplete Block Design ? 10
- (c) A-2<sup>2</sup> experiment in six randomised blocks was conducted in order to obtain an idea of the interaction. 10

Block - 1

(1)	<i>s</i>	<i>ns</i>	<i>n</i>
117	106	109	114

Block - 2

<i>ns</i>	(1)	<i>s</i>	<i>n</i>
114	120	117	114

Block - 3

(1)	<i>n</i>	<i>s</i>	<i>ns</i>
111	117	114	106

Block - 4

<i>ns</i>	<i>n</i>	<i>s</i>	(1)
93	121	112	108

Block - 5

<i>ns</i>	<i>s</i>	(1)	<i>n</i>
75	97	73	38

Block - 6

<i>n</i>	(1)	<i>ns</i>	<i>s</i>
58	81	105	117

Analyse the data to find out if there are any significant treatment effects - Main or interaction.

- (d) What do you mean by analysis of covariance ? 10

7. Answer the following sub-questions :

- (a) (i) What are the three basic principles of design ? Explain them. 5  
 (ii) What is meant by confounding in a factorial experiment ? 5
- (b) Write a note on missing plot techniques. 10

- (c) For  $2^3$  factorial experiment three factors N, P, K each 2 levels, the design and yield per plot are given below Analyse the experiment. 10

		Replicate - 1						Replicate - 2			
Block - 1		(1)	pk	nk	np	Block - 3	p	npk	n	k	
		25	24	32	30		32	42	46	39	
Block - 2		n	k	npk	p	Block - 4	nk	(1)	np	pk	
		30	32	36	27		34	44	30	26	
		Replicate - 3						Replicate - 4			
Block - 5		npk	k	n	p	Block - 7	np	(1)	pk	nk	
		30	32	28	26		32	34	39	41	
Block - 6		(1)	pk	nk	np	Block - 8	npk	n	p	k	
		24	20	28	36		45	41	29	35	

- (d) Explain the analysis of Covariance for a oneway layout with one concomitant variable. 10

#### SECTION - D

8. Answer the following sub-questions :

- (a) Calculate :

15

- (i) Laspeyre's Index
- (ii) Paaschee's Index
- (iii) Drobish and Bowley's Index
- (iv) Fisher's Index
- (v) Marshall and Edgeworth's Index

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(vi) Walsch's Index.

Commodity	1982		1985	
	Price	Quantity	Quantity	Price
A	5	100	150	6
B	4	80	100	5
C	2.5	60	72	5
D	12	30	33	9

- (b) Define Life table. What are the uses of life tables ? State the assumptions in the construction of life-table. **15**
- (c) Calculate standardised Death rates (SDR). **10**

Age group in years	Locality A		Locality B	
	Standard Population		Local Population	
	Population	Deaths	Population	Deaths
under 5	4500	135	4000	144
5 - 15	10000	40	10500	63
15 - 65	12500	75	13500	81
above 65	3000	140	2000	102

9. Answer the following sub-questions :

- (a) Calculate the index Number using : **15**
- (i) Aggregate expenditure method and
- (ii) Family Budget method for the year 1975 with 1965 as the base year.

Commodity	Quantity in units in 1965	Price per unit in 1965	Price per unit in 1975
A	100	8.00	12.00
B	25	6.00	7.50
C	10	5.00	5.25
D	20	48.00	52.00
E	25	15.00	16.50
F	30	9.00	27.00

- (b) Compute the Crude Death rates (C.D.R.) of the two populations A and B from the following data. 15

Age group in years	A		B	
	Population	Deaths	Population	Deaths
Below 5	15000	360	40000	1000
5 - 30	20000	400	52000	1040
above 30	10000	280	8000	240

- (c) Calculate the gross and net reproduction rates. 10

Age group	Female Population (In thousands)	Female live births	Survival factor
15 - 19	1399	15133	0.9694
20 - 24	1422	94155	0.9668
25 - 29	1521	102676	0.9632
30 - 34	1756	72490	0.9584
35 - 39	1451	31402	0.9519
40 - 44	1689	10640	0.9424
45 - 49	1667	700	0.9279

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