

2006
STATISTICS - II (Optional)

000054

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 will be penalised.

1. Answer any four of the following :

- (a) Define dual of a L.P.P. What is the use of dual LPP in Economics ? With suitable example, illustrate that the dual of the dual of primal LPP is primal LPP itself. **10**
- (b) Explain the use of OC curve in inspection sampling plan. Derive OC function for double sampling plan. **10**
- (c) "LSD is incomplete 3-way layout", explain. Show that in case of LSD, mean error sum of square is unbiased estimate of error variance. **10**
- (d) What is the seasonal variation in time series ? Explain ratio to moving average method for computing seasonal indices. **10**
- (e) Solve the following LPP by Big-M method **10**

$$\text{Min } Z = 2x_1 + x_2$$

$$\text{st- } 3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3, \quad x_1, x_2 \geq 0$$

P.T.O.

SECTION - A

2. (a) State and prove the sufficient condition for the optimality of a basic feasible solution. **10**
- (b) The captain of a cricket team has to allot five middle batting positions to five batsmen. The average run scored by each batsman at these position are given below. **15**
- (i) Find the assignments of batsman to batting position which would give the maximum score.

Batting Position					
Batsman	III	IV	V	VI	VII
Rahul	40	40	35	25	50
Sachin	42	30	16	25	27
Mahendra	50	48	40	60	50
Robin	20	19	20	18	25
Irfan	58	60	59	55	53

- (ii) If another batsman Jay with the following average runs in the batting positions as given below :
- Position : III IV V VI VII
- Average runs : 45 52 38 50 49
- is also considered, should he be included in the team ?
- (c) Discuss the LCG for generating random numbers from $U[0,1]$ **15**
3. (a) How will you diagnose the following from final simplex table ? **10**
- (i) Optimum solution
- (ii) Unbounded solution
- (iii) No solution
- (iv) Multiple optimum solution
- How will you obtain alternative optimum solution from the given optimum solution (if exists) ?

- (b) Obtain initial basic feasible solution to the following Transportation problem using 15
 (i) North West corner rule,
 (ii) VAM
 and comment.

		To				Availability
		Mumbai	Bangalore	Agra	Chennai	
From	Kolkata	6	5	8	8	30
	Nagpur	5	11	9	7	40
	Ranchi	8	9	7	13	50
	Requirement	35	20	30	25	

- (c) Explain inverse transformation method to obtain random sample from specified 15
 distribution using random numbers from $U[0,1]$. Illustrate with suitable example.

SECTION - B

4. (a) Derive the control limits for C charts when parameters are (i) known and 10
 (ii) unknown. Can lower control limit be negative?
- (b) (i) Differentiate between product control and process control. 5
 (ii) Explain producer's risk and consumer's risk. 5
- (c) What do you mean by process capability index? Is C_p appropriate capability 10
 index?
- (d) Define reliability of an equipment. Derive the expression for failure rate for Weibull 10
 distribution.
5. (a) What do you mean by Statistical Quality control. Discuss briefly it's need in 10
 industry.
- (b) (i) State the limits for 'p' chart. How will you judge the lack of control in case 5
 of 'p' chart?
 (ii) Give the flow chart for double sampling plan. 5
- (c) Discuss the capability indices C_{pk} and C_{pm} and their interpretation. 10
- (d) Discuss the reliability of series and parallel system. If a component has failure 10
 rate of 0.05 per thousand hours, using exponential distribution find the probability
 that the equipment will survive for atleast 10000 hours.

P.T.O.

SECTION - C

6. (a) (i) What is the role of 'replication' in designing the experiment ? 5
 (ii) Give sign table for 2^3 factorial experiment. 5
- (b) Define BIBD. Obtain the expression for efficiency of BIBD relative to RBD. 10
- (c) What is confounding in F. E. ? Differentiate between complete and partial confounding. State the advantages of confounding. 10
- (d) Mention any five (out of seven) points highlighting the distinguishing features of Taguchi method. 10
7. (a) (i) Explain the role of randomization in designing the experiment. 5
 (ii) Give Yates table for 2^3 factorial experiment. 5
- (b) Derive the estimate of one missing entry in RBD. 10
- (c) How will you identify the confounded interaction in a given replication ? Illustrate with example. 10
- (d) Explain the concept of 'Analysis of Covariance'. Give the ANCOVA table for single factor design with one covariate. 10

SECTION - D

8. (a) Explain the various tests of adequacy of index numbers. 15
- (b) Explain Crude Death Rate and Age Specific death rate in detail. Under what condition age specific death rate will be same as crude death rate. 15
- (c) Define standardized death rate. What is its advantage over age specific death rate ? Explain indirect method of standardization. 10
9. (a) Define consumer's price index number. Mention the various steps in its construction using family budget data. 15
- (b) Explain the registration method for obtaining vital statistics. Mention the shortcomings of registration method. What are your suggestions for improving registration method ? 15
- (c) Discuss Net Reproduction Rate with its merits and limitations. Under what condition NRR will be same as GRR ? 10

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