CSM—65/23

PART—II/PAPER—VII

STATISTICS

PAPER—II

Candidate must not write on this margin.

Time : 3 Hours

Full Marks : 250

The question paper contains **18 (Eighteen)** *questions in* **GROUP—A, (12)** *and* **GROUP—B, (06)** *together.*

GROUP—A

Candidates to attempt **10** ***(ten)*** *questions within word limit of* **250**. *Each question carries* **15** *marks.*

1. Describe about the sequential sampling plan for attributes and obtain its acceptance and rejection lines, including their interpretation.

2. Distinguish between cumulative sum (CUSUM) and Shewhart control charts. Describe a method for designing V-mask with its disadvantages, if any.

3. Explain about different criteria used for detection of lack of control in $\bar{X}$ and R control charts.

4. Show that $\overline{F(t+x)} = \overline{F(t)} \times \overline{F(x)}$ if and only if $F(.)$ is the distribution function of exponential distribution with $t,\ x \geq 0$ and $\overline{F(.)} = 1 - F(.)$.

5. Describe the concept of 'Positive Ageing' and discuss in detail various ways of modeling of positive ageing.

6. Suppose $Y = f(X_2, X_3)$ and the functional relation is linear i.e. multiple regression model can be stated in the form

$$-Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

where the symbols used have their usual meanings. Given n observations, estimate β_1, β_2 and β_3 clearly stating the assumption used if any. Also obtain the relationship between simple and partial regression coefficients.

Candidate must not write on this margin.

7. Consider the model $-Y_i = \alpha + \beta X_i + e_i$, where the symbols used have their usual meanings. Test for autocorrelation with the following observations on Y and X using Durbin-Watson statistic at 5% level of significance.

[Given lower critical value = 1·08 and upper critical value = 1·36]

X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	2	2	2	1	3	5	6	6	10	10	10	12	15	10	11

8. Write down the possible reasons for multicollinearity and the tests for its detection.

9. Discuss about various problems in the construction of index numbers. Also explain the need of chain base index numbers.

10. Explain the functioning of statistical system in India at the Central and State levels.

11. Describe the role of National Sample Survey Organisation (NSSO) and discuss about the strength of National Sample Survey.

12. Describe the need and importance of index of industrial production. Also explain the general procedure of selection of item basket for computation of All-India index of industrial production.

GROUP—B

Candidates to attempt **05** ***(five)*** *questions within word limit of* **300**.

Each question carries **20** *marks.*

13. A chemical company produces two compounds A and B. The following table gives the units of ingredients C and D per kg. of compounds A and B as well as minimum requirements of C and D and cost per kg. of A and B. Using the simplex method, find the quantities of A and B which would give a supply of C and D at minimum cost.

		Compounds		Minimum Requirement
		A	B	
Ingredients	C	1	2	80
	D	3	1	75
Cost per kg.		4	6	

14. Discuss about the General Transportation Problem. When do we say that the transportation problem is 'unbalanced'? Describe a method of finding the initial feasible solution and the procedure of testing its optimality.

15. Show that in Linear Programming (LP) problem the dual of the dual is primal. Also show that the value of objective function Z (say) for any feasible solution of the primal is $\leq$ the value of the objective function W (say) for any feasible solution of the dual.

16. Explain the concepts of reliability and validity of tests and distinguish between them.

17. Define total fertility rate (TFR), gross reproduction rate (GRR) and net reproduction rate (NRR) and explain how they differ from one another as measures of reproduction.

18. Explain the crude and standardized death rates. In what way a standardized death rate is superior to crude death rate? Give briefly the direct and indirect methods of finding standardized death rates.

★★★

Candidate must not write on this margin.

SPACE FOR ROUGH WORK

Candidate must not write on this margin.