Code No. : 23(II) *Roll No.* ....

0(CCEM)9

STATISTICS

Paper : II

Time Allowed : 3 hours] [*Maximum Marks : 300*

Note : (i) *Answers must be written in English.*

(ii) *Number of marks carried by each question are indicated at the end of the question.*

(iii) *Part/Parts of the same question must be answered together and should not be interposed between answers to other questions.*

(iv) **The answer to each question or part thereof should begin on a fresh page.**

(v) **Your answers should be precise and coherent.**

(vi) *Attempt five questions selecting any three Sections of choice.*

SECTION – I

1. (a) Describe the mathematical model of randomized block design (RBD) and give its analysis. Obtain the expectation of sum of squares due to treatments and error sum of squares.   30

   (b) Why we use total and partial confounding in factorial experiments ? Discuss the analysis of 2^3 factorial experiments when all higher order interaction effects are totally confounded.   30

2. (a) State briefly the advantages of sampling over complete enumeration.   30

   (b) What is Systematic Sampling ? Obtain an unbiased estimate of the population mean and find its variance.   30

SECTION – II

3. (a) Explain and bring out the distinction between Acceptance Quality Level (A. Q. L.) and Average Outgoing Quality Limit (A. O. Q. L.).   30

   (b) Describe single sampling plan in quality control. Obtain O. C. curve for this plan.   30

4. (a) Define failure rate in the context of reliability. Derive the failure rates of exponential and Weibull models and discuss their characteristics.   30

   (b) What is the basis of 3-σ limits ? When is a process said to be out of control ? Describe the construction of $(\overline{X}, R)$ and cumulative sum control charts.   30

(2)

SECTION – III

5. (a) Give any *three* definitions of Operations Research. Explain briefly the general methods for solving O. R. Models. 30

(b) Define a basic solution and a basic feasible solution to a Linear Programming Problem. Determine all basic solutions to the system of equations : 30

$$2x_1 + x_2 + 4x_3 = 11$$

$$3x_1 + x_2 + 5x_3 = 14$$

6. Define slack and surplus variables used in Linear Programming. Solve the given L. P. P. by simplex method :

Max $z = 45x_1 + 80x_2$

Subject to $5x_1 + 20x_2 \le 400$

$$10x_1 + 15x_2 \le 450$$

$$x_1, x_2 \ge 0$$ 60

SECTION – IV

7. (a) What is an Index number ? Explain Time Reversal Test as test of consistency for a good Index number. 30

    (b) Show that Fisher's ideal index number formula satisfies Time Reversal Test.   30

8. (a) Explain clearly what is meant by trend of a Time Series ? Describe the method of fitting a straight line for determining trend in a time series.   30

    (b) Examine the merits and demerits of the above method of fitting a straight line for trend values.   30

SECTION – V

9. Explain the structure of a complete life table. How does an abridged Life table differ from a complete life table ? Mention the uses of a life table.   60

10. (a) What do you understand by a T-scale ? Explain the method of converting raw test scores into T-scores.   30

    (b) Define reliability and validity of tests. Give the range of reliability and the important factors affecting the reliability of a test.   30