KB-55046

Seat No._____

M. Sc. (Part-I) Examination

April / May – 2003

Statistics : Paper-IV

(Mathematical Programming & Computer Programming)

Time : **3** Hours] [Total Marks : **75**

Instructions : (1) All questions carry **equal** marks.

(2) Use of calculator and statistical tables is permissible.

1 (a) Explain the terms :

(i) Convex set

(ii) Extreme point

(iii) Non degenerate basic feasible solution

(iv) Artificial variables

(v) Canonical form of LPP.

(b) Show that every vertex of set S_F is a basic feasible solution of the LPP.

(c) Discuss Two Phase Method for solving a LPP.

OR

1 (a) Define Transportation Problem and show that it is a special case of LPP.

(b) Show that for $m \times n$ transportation problem, there always exists a solution. Also show that a basic feasible solution contains $(m+n-1)$ basic variables.

(c) Discuss MODI Method for obtaining Optimal solution for a Transportation problem.

2 Derive completely simplex procedure for solving analytically LPP. Discuss how would you solve the problem when (i) there is unbounded (iii) there is alternate solution, (iii) the variables are bounded (iv) there is no restriction upon the variables.

OR

2 (a) State and prove weak duality theorem. Explain its significance.

(b) Derive complementary Slackness theorem for duality in linear programming.
Discuss its importance in solving primal and dual problems.

(c) Write dual of the following LPP.

Maximize $Z = \underline{c}' \underline{x}$

such that $A\underline{x} = \underline{b}$, $\underline{x}$ are unrestricted is signs.

3 (a) Explain the terms :

(i) Value of the game
(ii) Game matrix
(iii) Saddle point
(iv) Optimal strategy

(b) Discuss briefly the practical applications of a non-linear programming problem.

(c) Discuss in brief :

(i) Dual simplex method
(ii) Revised simplex method.

OR

3 (a) Define the following terms with suitable examples.

(i) COMPUTED GO TO statement
(ii) Arithmetic IF statement
(iii) Logical If statement
(iv) IF-THEN-ELSE structure

(b) Write a FORTRAN program to obtain value of 2×2 two-person-zero sum game having pay-off matrix for player A as :

$$\begin{array}{ccc} & \textit{Player } B & \\ & B_1 & B_2 \\ \textit{Player } A \quad A_1 & a_{11} & a_{12} \\ A_2 & a_{21} & a_{22} \end{array}$$

(i) with saddle point and
(ii) Without saddle point.

4 (a) Explain the terms :

(i) DO LOOP
(ii) Nested DO LOOP
(iii) Implied DO LOOP giving their general structure and example of each.

(b) Write a FORTRAN program to find the Range $R = X_{\max} - X_{\min}$ given a set of observations $X_1, X_2, X_3 \ldots\ldots X_n$.

(c) Write a DATA statement for the following :

$A(1) = A(2) = A(3) = ... = A(20) = 2 \cdot 6,\ A(21) = A(22) = A(23) = A(24) = B = C = 5 \cdot 8,\ D = E = X = 5 \cdot 1$

OR

4 (a) Explain the following FORMAT codes :

(i) Iω (ii) Fω·d

(iii) Eω·d (iv) Dω·d

(v) Aω (vi) ωH

(b) If $A = 1055 \cdot 8761,\ B = 32 \cdot 14,\ I = 954678,\ J = 25,$ describe the output of the following FORMAT statement :

WRITE (6, 50) I, J, A, B

50 FORMAT ($I2, 2X$; $I5$ //// $1X, F5 \cdot 2,\ E15 \cdot 8$)

(c) Write a SUBROUTINE subprogram to multiply matrix R of order $L \times M$ with a matrix S of order $M \times N$. The input to the SUBROUTINE will be the names of two matrices and their orders. The output will be product matrix T of order $L \times N$. Write a main segment that will use MATMUL subroutine to compute the matrix polynomial $C = 5X + 8Y^2 - 6Z^2$.

5 (a) Determine the storage lay out which will result from the following program segments.

(i) DIMENSION A (2, 3), B(2, 2), C(5)
EQUIVALENCE (A(1), B(1), C(1))

(ii) DIMENSION A(4), C(2), D(8)
COMMON A, B, C
EQUIVALENCE (A(3), D(1))

(b) Define an Arithmetic statement function to compute $A(x, y) = \sqrt{x^2 - y^2}$ and use it to compute :

$$G = \frac{d_1\sqrt{d_1^2 - d_2^2}}{\log_{10} d^2} - d_2^2 \left| \frac{d_1 - \sqrt{d_1^2 - d_2^2}}{2} \right|$$

(c) Write a function subprogram to evaluate a 2nd order determinant and use this Function subprogram to compute a 3rd order determinant.

OR

5 (a) Explain the difference between :

(i) Sequential file and Random access file

(ii) COMMON statement and EQUIVALENCE statement

(iii) LOGICAL data and COMPEX data

(iv) Subscripted variable and Real variable.

(b) State whether the following statements are true or false. If false, correct it.

(i) STATISICS and X-RAY are real variable names whereas MATRIX and 4 IJK are integer variable names.

(ii) A transfer into domain of a D_0 from outside is permitted but transfer from the domain of a D_0 to outside do loop is not permitted.

(iii) COMMON and EQUIVALENCE statements should be used simultaneously in the same program.

(c) Answer the following :

(i) If $J = 5$ and $I = J/2 * 4 + 5/8 + (J**3)/2$, find the value of I.

(ii) Find the final value of K in the following program segment.

```
      K = 3
      M = 2
      Do 10 J = 4, 9, M
      IF (J·EQ·6) GO TO 10
      K = K + 2 * J
   10 CONTINUE
      K = 3 * K + 3/8
```

(iii) Write the FORTRAN program segment for the following : If $2 \leq x \leq 5 \cdot 5$ transfer control to the statement labelled 16 otherwise transfer control to the statement labelled 85.

(iv) Rewrite without using Do Loop :

```
      DO 10 I = 1, 5
      DO 20 J = 1, 3
      DO 30 K = 1, 2
      READ (*, *) A (I, J, K)
   30 CONTINUE
   20 CONTINUE
   10 CONTINUE
```