Seat No. : _______________

XD-123

T.Y.B.Sc.

March-2013

Statistics : Paper – X

(Operations Research)

Time : 3 Hours] **[Max. Marks : 105**

Instruction : Questions (a) & (b) carry **9** marks each and (c) carry **3** marks.

1. (a) Write general form of LPP and define slack, surplus and artificial variables. **21**

OR

Write the algorithm to solve a linear programming problem by simplex method.

(b) United Aluminium company produces three grades (high, medium, and low) of aluminium at two mills. Each mill has a different production capacity (in tons per day) for each grade as follows :

Grade	**Mill 1**	**Mill 2**
High	6	2
Medium	2	2
Low	4	10

The company has contracted with a manufacturing firm to supply at least 12 tons of high grade aluminium, 8 aluminium tons of medium-grade aluminium and 5 tons of low grade aluminium. Its cost United \$6000 per day to operate mill 1 and \$7000 per day to operate mill 2. The company wants to know the number of days to operate each mill in order to meet the contract at the minimum cost. Formulate the problem as linear programming problem.

OR

Solve the following LPP graphically. State the limitations of graphical method.

Min z = $0.05x_1 + 0.03x_2$

S.t. $8x_1 + 6x_2 \geq 48$

$x_1 + 2x_2 \geq 12$

and $x_1, x_2 \geq 0$

(c) What is the role of slack and surplus variable in LPP ?

2. (a) Define **21**

(i) Solution to a LPP

(ii) Feasible Solution

(iii) Basic Solution

(iv) Basic Feasible Solution

(v) Convex set

OR

Explain in detail two-phase method to solve LPP.

(b) Use two phase method to solve the following LPP :

Max $z = 5x_1 + 2x_2$

s.t. $2x_1 + x_2 \leq 1$

$x_1 + 4x_2 \geq 6$, and $x_1, x_2 \geq 0$

Solve the following LPP by simplex method :

Max $z = 23x_1 + 25x_2$

s.t. $2x_1 - 3x_2 \leq 6$

$x_1 + 5x_2 \leq 10$

$x_2 \leq 10$, and $x_1, x_2 \geq 0$

(c) State fundamental theorem on duality and explain primal dual relationship.

3. (a) Explain the VAM method to solve the Transportation problem. **21**

OR

Give comparison between transportation problem and Assignment problem.

(b) Explain transportation problem as a particular case of linear programming problem.

OR

Solve the following transportation problem by VAM and obtain the optimum solution to minimize the total transportation cost :

Origins \ Store	1	2	3	4	Capacity
A	6	3	5	4	22
B	5	9	2	7	15
C	5	7	8	6	8
Demand	7	12	17	9	45

(c) Explain loop in transportation problem.

4. (a) What is Inventory problem ? Define various costs associated with Inventory problem. Also define lead time. **21**

OR

Explain in detail EOQ model with uniform demand.

(b) An aircraft company uses rivets at an approximate customer rate of 2500 kg. per year. Each unit costs ₹ 30 per kg and the company personal estimate that it cost ₹ 130 to place an order, and that the carrying cost of inventory is 10% per year. How frequently should orders for rivets be placed ? Also determine the optimum size of each order.

OR

The production department for a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is ₹ 36 and the cost of carrying inventory is 25 percent of the investment in the inventories. The price is ₹ 10 per kg. The purchase manager wishes to determine an ordering policy for the raw material.

(c) What are the assumptions for EOQ models ?

5. (a) Write the steps involved in processing the n jobs through two machines. **21**

OR

Explain the method for solving a two person zero-sum game without saddle point by algebraic method.

(b) Solve the following game :

Player B / Player A	B_1	B_2
A_1	6	9
A_2	8	4

OR

There are five jobs, each of which is to be processed through two machines M_1 and M_2 in the order M_1, M_2, processing hours are as follows :

Job	1	2	3	4	5
Machine A	3	8	5	7	4
Machine B	4	10	6	5	8

Determine the optimum sequence for the five jobs and minimum elapsed time. Also, find the idle time of machines A and B.

(c) What is dominance property ?