2020

STATISTICS — GENERAL

Paper : DSE-A-2

(Operations Research)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Day 3

1. Answer ***any ten*** of the following : 1×10

(a) Surplus variable are only associated with maximization problem in simplex method. (True/False)

(b) The graphical method is used when we have any number of decision variables in the problem. (True/False)

(c) If no optimal solution, the simplex method indicates that no finite solution exists. (True/False)

(d) A linear programming problem may have unbound region but it has solution. (True/False)

(e) MODl's Method is used for obtaining Basic feasible solution. (True/False)

(f) Basic feasible solution obtained by Vogel's Approximation Method always has optimal solution. (True/False)

(g) A basic feasible solution of a transportation problem has only $m + n - 1$ positive components, where 'm' is the number of rows and 'n' is the number of columns. (True/False)

(h) The basic feasible solution of a transportation problem is always degenerate. (True/False)

(i) By changing the rows of the primal problem (dual problem) into columns we get the dual problem (primal problem) and vice versa. (True/False)

(j) If at least one artificial variable is positive in the optimum iteration, then the LPP has no feasible solution. (True/False)

(k) If all the entries of cost matrix in an assignment problem are increased by a constant, then it will affect the optimal solution of the problem. (True/False)

(l) A basic feasible solution should satisfy non-negativity constraint. (True/False)

(m) A balanced transportation problem may not have any feasible solution. (True/False)

(n) In an LPP, the numbers of variables in the primal problem are less than the number of constraints in the dual. (True/False)

(o) A two-dimensional linear programming problem can have at most two optimal solutions. (True/False)

2. Answer ***any four*** of the following : 5×4

(a) Obtain the dual of the following problem (dual must contain exactly 3 contraints and 3 variables) :

Maximize : $z = x_1 - 3x_2 - 2x_3$

subject to :

$3x_1 - x_2 + 2x_3 = 5,$

$x_1 - 2x_2 \le 3,$

$2x_2 - x_3 \ge 8;$ $x_1, x_2 \ge 0$ and x_3 is unrestricted in sign.

(b) Four salespersons are to be assigned to four territories. The returns (in thousands of Rs.) obtained on assigning each salesperson to each territory is given in the following table :

		Salespersons			
		I	II	III	IV
Territories	A	−1	−2	3	4
	B	2	−4	3	5
	C	4	3	−6	7
	D	3	2	5	7

Find an assignment that maximizes the returns. What is the maximal return?

(c) Write the steps of the algorithm for solving LPP by the simplex method.

(d) What are various phases of operations research?

(e) What is the difference between Assignment Problem and Transportation Problem?

(f) Find all the basic feasible solutions of the following system :

$x_1 + 2x_2 + x_3 = 4,\ 2x_1 + x_2 + 5x_3 = 5.$

3. Answer ***any two*** of the following :

(a) (i) Explain about Big-M method for solving LPP by the Simplex method.

(ii) Write the steps for solving Linear Programming Problem by Graphical method. State its limitations. 5+5

(b) (i) Write the LPP model of the following Transportation problem :

		Destination				
		I	II	III	IV	Supply
Sources	I	5	7	6	4	70
	II	2	8	3	1	50
	III	1	7	4	5	90
Demand		50	40	50	70	

(ii) Solve the following LPP by the two-phase simplex method and give your conclusions about the solution :

Maximize : $z = 3x_1 + x_2$

subject to :

$2x_1 + x_2 \geq 4,$

$x_2 \geq 2,$

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

(c) Define optimal solution. Find the initial basic feasible solution using North-West corner method for the following transportation problem :

		Warehouse			
		W1	W2	W3	Supply
Factory	F1	16	20	12	200
	F2	14	8	18	160
	F3	26	24	16	90
Demand		180	120	150	

Also, find the optimal solution. 10