

## BBA 4th Semester Exam., 2016

## OPERATIONS RESEARCH AND LOGISTICS

Time : 3 hours

Full Marks : 60

Instructions :

- (i) The questions are of equal value.
- (ii) There are **SEVEN** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question Nos. 1 and 2 are compulsory.

1. Choose the correct answer of the following (any six) :

~~(a)~~ Which statement characterizes standard form of a linear programming problem?

~~(i)~~ Constraints are given by inequalities of any type

(ii) Constraints are given by a set of linear equations

(iii) Constraints are given only by inequalities of  $\geq$  type

~~(iv)~~ Constraints are given only by inequalities of  $\leq$  type

~~(b)~~ Maximize  $Z = 3x$  for  $0 \leq x \leq 5$ . An optimal solution of the problem is

(i)  $x = 0$

~~(ii)~~  $x = 1$

(iii)  $x = 3$

(iv)  $x = 5$

~~(c)~~ The type of the feasible region given by the set of inequalities

$$x - y \leq 1, x - y \geq 2$$

where both  $x$  and  $y$  are positive is

(i) a triangle

(ii) a rectangle

(iii) an unbounded region

~~(iv)~~ an empty region

(d) Degeneracy occurs when

(i) the basic variables are positive but some of non-basic variables have negative values

(ii) the basic matrix is singular, it has no inverse

(iii) some of the basic variables have zero values

(iv) some of the non-basic variables have zero values

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- (e) Identify the status of the simplex method from the tableau :

	$x_1$	$x_2$	$x_3$	$x_4$	
$x_1$	1	-1	0	3	3
$x_3$	0	-2	1	1	4
$z$	0	0	0	0	-1

- (i) One more iteration is required
- (ii) Simplex method terminates : Unique optimal solution
- (iii) Simplex method terminates : Alternative optimal solutions
- (iv) Simplex method terminates : unbounded optimal solutions
- (f) An artificial variable
- (i) represents difference between the right-hand side and the left-hand side of a technological constraint
- (ii) is added to a technological constraint for finding an initial basic feasible solution
- (iii) equals zero identically
- (iv) is a dual variable associated to a constraint

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- (g) Which statement describes the weak duality theorem?

- ~~(i)~~ Finite-optimal solutions of the primal and dual problems have the same value of objective functions
- (ii) Objective function of the minimization problem may not be smaller than that of the maximization problem
- (iii) Objective function of the minimization problem may not be greater than that of the maximization problem
- ~~(iv)~~ If a primal problem has finite-optimal solution, the dual problem has also a finite-optimal solution

- (h) A dual problem in canonical form has four variables and two constraints. The optimal solution of the dual problem is

(i)  $w_1=1$

(ii)  $w_2=0$

(iii)  $w_3=6$

(iv)  $w_4=0$

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- (i) Which statement is true for the primal problem?
- (i) At least two decision variables of the primal problem are zeros
  - (ii) At most two slack variables of the primal problem are non-zeros
  - (iii) Primal problem has four variables and two constraints
  - (iv) Primal problem has unbounded value of the objective function
- ~~(ii)~~ The following statements are true, except for
- (i) computational time required by the simplex method may grow exponentially with the size of the system
  - ~~(ii)~~ binary search methods have polynomial-time complexity
  - (iii) method based on the representation theorem is more useful than the simplex method because it has the polynomial-time complexity
  - ~~(iv)~~ Karmarkar's projective algorithm is competitive to the simplex method because of its polynomial-time complexity

2. Answer any *three* of the following :

~~(a)~~ What do you understand by the term 'logistics'? What are the advantages of logistics management?

(b) Define warehousing. What are the features of warehousing?

~~(c)~~ Graphically solve the following problem of LP

Maximize :

$$Z = 3x_1 + 2x_2$$

subject to

$$2x_1 - 3x_2 \geq 0$$

$$3x_1 + 4x_2 \leq -12$$

$$x_1, x_2 \geq 0$$

(d) Solve the following linear programming problem using simplex method :

Maximize :

$$Z = x_1 + x_2$$

subject to

$$-2x_1 + x_2 \leq 1$$

$$x_1 \leq 2$$

$$x_1 + x_2 \leq 3x_1$$

$$x_2, x_3 \geq 0$$

~~(e)~~ What is meant by Laplace criterion?

Answer any three of the following :

3. What is meant by location of stores? Discuss the basic factors that must be taken into account to determine the best location for stores.

4. Consider the game of matching coins. Two players *A* and *B* each put down a coin. If the coins match, i.e., both are heads or both are tails, *A* gets rewarded otherwise *B* gets rewarded. However, matching on heads gives double premium. Obtain the best strategies for both players and the value of the game.

5. Write short notes on the following :

(a) Sensitivity analysis

(b) Steps in the simulation process

6. Solve the following transportation problem by least cost method and check the feasibility of the solution. The unit costs of shipment are given in the cells below :

To From	D	E	F	Supply
A	6	4	1	50
B	3	8	7	40
C	4	4	2	60
Demand	20	95	35	150

7. Belt snapping for conveyors in an open cast mine occurs at the rate of 2 per shift. There is only one hot plate available for vulcanising, and it can vulcanise on an average 5 belt snaps per shift.

(a) What is the probability that when a belt snaps, the hot plate is readily available?

(b) What is the average number of belts in the system?

(c) What is the average waiting time of an arrival?

(d) What is the average waiting time plus vulcanising time?

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