



**BRAINWARE UNIVERSITY**

**Term End Examination 2018 - 19**

**Programme – Master of Business Administration**

**Course Name – Operations Research**

**Course Code – MBA301**

(Semester – 3)

**Time allotted: 3 Hours**

**Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

**Group –A**

(Multiple Choice Type Question)

10 x 1 = 10

1. *Choose the correct alternative from the following*

- (i) While solving a LP model graphically, the area bounded by the constraints is called
  - a. Feasible region
  - b. Infeasible region
  - c. Unbounded solution
  - d. None of these
- (ii) For a maximization problem, the objective function coefficient for an artificial variable is
  - a. + M
  - b. – M
  - c. Zero
  - d. None of these
- (iii) To convert  $\geq$  inequality constraints into equality constraints, we must
  - a. Add a surplus variable
  - b. Subtract an artificial variable
  - c. Subtract a surplus variable and an artificial variable
  - d. Add a surplus variable and subtract an artificial variable
- (iv) If a primal LP problem has a finite solution then the dual LP problem should have
  - a. Finite solution
  - b. Infeasible solution
  - c. Unbounded solution
  - d. None of these

- (v) The purpose of a dummy row or column in an assignment problem is to
- a. Obtain balance between total activities and total resources
  - b. Prevent a solution from becoming degenerate
  - c. Provide a means of representing a dummy problem
  - d. None of these
- (vi) The method used for solving an assignment problem is called
- a. Reduced matrix method
  - b. MODI method
  - c. Hungarian method
  - d. None of these
- (vii) The quantitative approach to decision analysis is a
- a. Logical approach
  - b. Rational approach
  - c. Scientific approach
  - d. All of these
- (viii) Which of the following criterion is not applicable to decision making under uncertainty?
- a. Maximin
  - b. Maximax
  - c. Minimax
  - d. Minimize expected loss
- (ix) Operations research approach is
- a. Multi – disciplinary
  - b. Scientific
  - c. Intuitive
  - d. All of these
- (x) If dual has an unbounded solution, primal has
- a. No feasible solution
  - b. Unbounded solution
  - c. Feasible solution
  - d. None of these

**Group – B**

(Short Answer Type Questions)

3 x 5 = 15

Answer any *three* from the following

2. What is meant by a feasible solution of an LP problem? 5
3. A TV mechanic finds that the time spent on his job has an exponential distribution with mean of 30 minutes, if he repairs sets in the order in which they come in. If the arrival of sets is approximately Poisson distributed with an average rate of 10 per eight hour day, what is the mechanic’s expected idle time each day? 5
4. Describe the steps involved in North West Corner Rule. 5

5. Discuss and describe the role of linear programming in managerial decision-making. 5
6. Use the graphical method to solve the following LP problem.

$$\text{Max } Z = 2X_1 + X_2$$

s.t.

$$X_1 + 2X_2 \leq 10$$

$$X_1 + X_2 \leq 6$$

$$X_1 - X_2 \leq 2$$

$$X_1 - 2X_2 \leq 1$$

$$X_1, X_2 \geq 0$$

5

### Group – C

(Long Answer Type Questions)

3 x 15 = 45

Answer any *three* from the following

7. (a) Discuss the different types of decision making environment. 10
- (b) Pay – offs of three acts X, Y, Z and states of nature L, M, N are given below:

State of Nature	X	Y	Z
L	- 40	- 50	220
M	250	- 120	- 50
N	400	650	350

The probabilities of the states of nature are 0.30, 0.40 and 0.30 respectively.

Calculate the expected monetary values for different acts and select the best act.

5

8. A company sells two different products A and B, making a profit of Rs.40 and Rs.30 per unit, respectively. They are both produced with the help of a common production process and are sold in two different markets. The production process has a total capacity of 30000 man hours. It takes 3 hours to produce a unit of A and 1 hour to produce a unit of B. The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8000 units and that of B is 12000 units. Subject to these limitations, product can be sold in any combination. Formulate this problem as an LP model to maximize the profit. Solve the problem graphically. 6 + 9
9. Use Big M method to solve the following LP problem. 15
- $$\text{Max } Z = X_1 + 2X_2 + 3X_3 - X_4$$
 s.t.  

$$X_1 + 2X_2 + 3X_3 = 15$$

$$2X_1 + X_2 + 5X_3 = 20$$

$$X_1 + 2X_2 + X_3 + X_4 = 10$$

$$X_1, X_2, X_3, X_4 \geq 0$$
10. Explain the Primal Dual Relationship. What is the significance of dual variables in an LP model. 10 + 5

11. The mean rate of arrival of planes at an airport during the peak period is 20 per hour and the actual number of arrivals in any hour follows a Poisson distribution. The airport can land 60 planes per hour on an average in good weather and 30 planes per hour in bad weather, but the actual number landed in any hour follows a Poisson distribution with these respective averages. When there is a congestion, the planes are forced to fly over the field in the stack awaiting the landing of other planes that arrived earlier.
- a) How many planes would be flying over the field in the stack on an average in good weather and in bad weather?
  - b) How long a plane would be in the stack and in the process of landing in good and in bad weather?
  - c) How long a plane would be in the process of landing in good and bad weather after stack awaiting?

5+5+5

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