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Total No. of Questions : 07] [Total No. of Pages : 03

Paper ID [B0222]

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BCA (Sem. - 5th)

OPERATION RESEARCH (BC -504)

Time : 03 Hours Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - **B**.

Section - A

Q1) *(10 × 2 = 20)*

a) Discuss briefly the various assumptions in linear programming.

b) Define basic, slack, surplus & artificial variables.

c) Write a short note on Big M method.

d) Define objective function and objective function coefficient.

e) Define infeasible solution, unbounded solution, alternate solution and degenerate solution.

f) Define transportation problem. Describe its mathematical model.

g) Discuss briefly the practical applications of assignment problem.

h) Distinguish between integer programming and linear programming problem.

i) Define recursive function used in dynamic programming. Discuss briefly backward and forward recursive functions.

j) Discuss the similarity between transport problem and assignment problem.

Section - B

(4 × 10 = 40)

Q2) (a) What are the ways of improving productivity? Also, explain the role of operations research in improving productivity.

(b) Discuss briefly the various properties of linear programming solution.

Q3) (a) Discuss the steps of Hungerian's method to solve assignment problem.

(b) A company is planning to determine its product mix out of three different products : P_1, P_2 and P_3. The monthly sale of the product P_1 is limited to a maximum of 600 units. For every two units of P_2 produced, there will be one unit of by-product which can be sold @ Rs.20 per unit. The highest monthly demand for this by-product is 200 units. The contributions per unit of the products P_1, P_2 and P_3 are Rs.50, Rs.70 and Rs.60 respectively. The processing requirements of these products are as shown in following Table.

Process	Hours per unit			Available hours
	P_1	P_2	P_3	
I	3	5	2	1200
II	4	-	3	750
III	4	3	2	1400

Formulate a linear programming model to find out the optimum product mix such that the total contribution is maximized.

Q4) (a) Solve the following linear programming problem using simplex method.

Maximize $Z = 10X_1 + 15X_2 + 20X_3$

Subject to $2X_1 + 4X_2 + 6X_3 \leq 25$

$3X_1 + 9X_2 + 6X_3 \leq 35$

X_1, X_2 and $X_3 \geq 0$.

(b) Define a decision tree. Illustrate with an example.

Q5) (a) Discuss the various methods used to find out the initial basic solution of transportation problem. Discuss also the procedure for optimization of basic feasible solution of the same.

(b) The detail of two competitive alternatives is given the following Table. The initial outlay of each of the alternative is Rs.10,00,000. The life of each alternative is 10 years. Find the best alternative when the interest rate is 0%.

Alternative 1		Alternative 2	
Annual Revenue (Rs.)	Probability	Annual Revenue (Rs.)	Probability
3,00,000	0.3	4,00,000	0.1
4,00,000	0.4	5,00,000	0.5
5,00,000	0.3	6,00,000	0.4

Q6) (a) A retail store desire to determine the optimal daily order size for a perishable item. The store buys the perishable item @ Rs. 80 per kg and sells @ Rs.100 per kg. If the order of the size is more than demand, the excess quantity can be sold @ Rs.70 per kg in a secondary market; otherwise, the opportunity cost for the store is Rs.15 per kg for the unsatisfied portion of the demand. Based on the past experience, it is found that the demand veries from 50 kg to 250 kg in steps of 50 kg. The possible values of the order size are from 75 kg to 300 kg in steps of 75 kg. Determine the optimal order size which will maximize the daily profit of the store.

(b) Define integer programming. Why there is need for the same?

(c) What are the application areas of dynamic programming?

Q7) An animal food company must produce 200 kg of a mixture consisting of ingredients X_1 and X_2 daily. X_1 costs Rs.3 per kg and X_2 Rs.8 per kg. No more than 80 kg of X_1 can be used and atleast 60 kg of X_2 must be used. Formulate a LP model to minimize the cost and solve the problem to determine the values of X_1 and X_2.