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**MS-51**

**MANAGEMENT PROGRAMME (MP)**

**Term-End Examination**

**June, 2021**

**MS-51 : OPERATIONS RESEARCH**

*Time : 3 Hours*

*Maximum Marks : 100*

*Weightage : 70%*

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**Note :** (i) *Attempt any five questions.*

(ii) *All questions carry equal marks.*

(iii) *The word limit for essay type questions is*

*800-1000 words and for short answer*

*type questions is 200-300 words.*

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1. “An operations research team consists of trained researchers utilizing the skills and tools of applicable sciences.” Explain some tools and techniques used by operations research team.

2. What is integer linear programming ? Explain the merits and demerits of “rounding off the continuous optimum of a linear programming problem.”
3. A local travel agent is planning a charter trip to a major sea port. The eight day/seven night package includes the fare for round trip, surface transportation, board and lodging and selected tour options. The charter trip is restricted to 200 persons and the past experience indicates that there will not be any problem for getting 200 clients. The problem for the travel agent is to determine the number of Deluxe, Standard and Economy tour packages to offer for this charter. These three plans differ according to seating and service for the flight, quality of accommodations, meal plans and tour options. The following table summarizes the estimated prices for the three packages and the corresponding expenses for the travel agent.
- The travel agent has hired an aircraft for the flat fee of ₹ 2,00,000 for the entire trip.

**P. T. O.**

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In planning the trip, the following considerations must be taken into account :

- (i) At least 10% of the packages must be Deluxe type.
- (ii) At least 35% but not more than 70% must be the Standard type.
- (iii) At least 30% must be of the Economy type.
- (iv) The maximum number of Deluxe packages available in any aircraft is restricted to 60.
- (v) The hotel desires that at least 120 of the tourists should be on the Deluxe and Standard packages taken together.

**Price and costs for tour packages per person :**

Tour Plan	Price (₹)	Hotel Costs (₹)	Meal and Other Expenses (₹)
Deluxe	10,000	3,000	4,750
Standard	7,000	2,200	2,500
Economy	6,500	1,900	2,200

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The travel agent wishes to determine the number of packages to offer in each type so as to maximize the total profit.

Formulate this as a linear programming problem.

4. Find initial basic feasible solution for the following transportation problem using Vogel's approximation method :

Per Unit Profit (₹)

Market

		A	B	C	D
Warehouses	X	12	18	6	25
	Y	8	7	10	18
	Z	14	3	11	20

**Availability at warehouses :**

X : 200 units  
Y : 500 units  
Z : 300 units

**Demand in the markets :**

A : 180 units  
B : 320 units  
C : 100 units  
D : 400 units

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5. Write the dual of the following linear programming problem (LPP) :

Maximise :

$$z = 10y_1 + 8y_2 - 6y_3$$

subject to :

$$3y_1 + y_2 - 2y_3 \leq 10$$

$$-2y_1 + 3y_2 - y_3 \geq 12$$

$$y_1, y_2, y_3 \geq 0.$$

6. Using the following data, obtain the economic order quantity (EOQ) and the total variable cost associated with the policy of ordering quantities of that size :

Annual Demand                      ₹ 20,000

Ordering Cost                        ₹ 150 per order

Inventory Carrying Cost        24% of average

inventory value

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7. Write short notes on any *three* of the following :

(a) Random experiment and probability

(b) Dynamic programming

(c) Characteristics of a queuing model

(d) Saddle Point

(e) Reasons for using simulation

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