EXADEMY

ONLINE NATIONAL TEST

Course: UPSC – CSE - Mathematics Optional

Test 2

Subject: **LINEAR PROGRAMMING** Time: **2 Hours**

Total Questions: **5** Total Marks: **(5x20 = 100)**

1. A company has A, B and C which supply warehouses D,E and F and G. Monthly factory Capacities are 180,170 and 200 units respectively. Monthly warehouses requirements are 90, 100, 120 and 180 units respectively. Unit shipping cost in Rupees are given in the table below. Determine the initial feasible solution using Vogel's approximation and find the optimum distribution for this company

Factories	D	E	F	G	Supplies
A	44	50	40	39	180
B	42	51	54	53	170
C	41	40	42	45	200
Requirements	90	100	120	180	

(20 Marks)

2. Two products A and B are to be machined on three machine tools P, Q and R. Product A takes 10 hours on machine P, 6 hours on machine Q, and 5 hours on machine R. The product B takes 7.5 hours on machine P and 9 hours on machine Q and 13 hours on machine R. The machining time available on these machine tools P, Q and R are respectively 75 hours, 54 hours, and 65 hours per week. The producer contemplates profit off Rs. 60 per product A, Rs 70 per product B.

   i. Formulate LP model for the above problem and show the feasible region graphically/geometrically. **(4 Marks)**
   ii. What are the basic feasible solution for the above problem? **(4 Marks)**
   iii. Estimate graphically/ geometrically optimum product mix for maximizing the profit. **(4 Marks)**
   iv. Explain why one of the vertices of the feasible region becomes the optimum solution point. **(4 Marks)**
   v. Verify the above problem using simplex method. **(4 Marks)**

3. Use Charne's penalty method (Big M Method) to Minimize $Z = 2x_1 + x_2$
   Subject to $3x_1 + x_2 = 3,\ 4x_1 + 3x_2 \geq 6,\ x_1 + 2x_2 \leq 3,\ x_1, x_2 \geq 0$

(20 Marks)

4. Solve the following transportation problem

From \ To							
	9	12	9	6	9	10	5
	7	3	7	7	5	5	6
	6	5	9	11	3	11	2
	6	8	11	2	2	10	9
	4	4	6	2	4	4	22

(20 Marks)

5. Use iterations to Maximize x_1
   Subject to $x_1 + x_2 \geq 7$
   $x_1 + x_2 \leq 6$
   $x_1, x_2 \geq 0$

(20 Marks)

Verify graphically as well.

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