Advance Engineering Mathematics(AEM)

Branch :Information Technology, Sem:IIIrd

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Vision of the Institute

To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities

Mission of the Institute

- Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- Identify, based on informed perception of Indian, regional and global needs, the areas of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academia and industry.
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.

Course Outcomes

- **CO2:** To learn the formulation of different mathematical problems into optimization problems.
- **CO3:** Apply the principles of optimization using differential calculus.
- **CO4:** To understand the concepts of Linear Programming
- **CO1:** To learn the concepts and principles of Random variables and Probability distribution.

Optimality Test by Modified Distribution (MODI) / u-v method – Transportation Problem

Optimality Test

- After getting the initial BFS of a transportation problem, we TEST this solution for optimality, i.e., to check whether the solution is OPTIMAL or NOT.

Remember: We need m+n-1 allocations in independent positions to start the Optimality test.

Q3. A company has four factories F1, F_2, F_3 $F_{4,}$ from which is supplies to three warehouses W_1 ,W_2 ,W_3. Determine the optimal transportation plan from the following data giving the factories to warehouses shifting costs. Quantities available at each factory and quantities at each warehouse.

	F_1	F_2	F_3	F_4	Required at warehouses
W_1	6	4	1	5	14
W_2	8	9	2	7	16
W_3	4	3	6	2	5
Available at factory	6	10	15	4	35

Sol:

STEP I: By Vogel's Approximation Method, initial B.F.S.is

		$V_1=6$		$V_2=4$		$V_3=0$		$V_4=4$	
		F_1		F_2		F_3		F_4	Required at warehouses
$U_1=0$,	W_1	4	6	10	4		1		5	14
$U_2=2$,	W_2	1	8		9	15	2		7	16
$u_3=-2$,	W_3	1	4		3		6	4	2	5
Available at factory			6		10		15		4	35

STEPII: Determine a set of u_i, i=1 to m; v_j, j=1 to n, such that for each occupied cell(r,s) $C_{rs}=u_r+v_s$. . For this we assign an arbitrary value to one of the u_i'sor v_j's and rest of them can be calculated easily from it. Generally we choose that u_i or v_j equal to 0.

Taking occupied cell: $C_{rs}=u_r+v_s$.

$C_{11}=u_1+v_1=6$,

$C_{12}=u_1+v_2=4$,

$C_{21}=u_2+v_1=8$,

$C_{23}=u_2+v_3=2$,

$C_{31}=u_3+v_1=4$,

$C_{34}=u_3+v_4=2$,

Now find the values of

$u_1=0, v_1=6, v_2=4, v_3=0, v_4=4, u_2=2, u_3=-2,$

Step III: We Calculate cell evaluation d_{ij} for each unoccupied cell (i,j) by the formula $d_{ij} = C_{ij}-(u_i+v_j)$,

$D_{13}=1-(0+0)=1$, $D_{14}=5-(0+4)=1$,

$D_{22}=9-(2+4)=3$, $D_{24}=7-(2+4)=1$,

$D_{32}=3-(-2+4)=1$, $D_{33}=6-(-2+0)=8$,

Step IV: Since all $d_{ij} \geq 0$ for unoccupied cell the given solution is an optimal solution .

Thus the optimal solution is

Cost =24+ 40+8+30+4+8=Rs. 114

Q4. Solve the transportation problem for which the cost, origin availabilities and destination requirement are given below:

	W_1	W_2	W_3	W_4	Supply
F_1	2	3	5	1	7
F_2	7	3	4	6	9
F_3	4	1	7	2	18
Demand	5	8	7	14	34

Sol: By VAM initial B.F.S. is given by

	W_1	W_2	W_3	W_4	Supply
F_1	5 2	3	5	2 1	7
F_2	7	2 3	7 4	6	9
F_3	4	6 1	7	12 2	18
Demand	5	8	7	14	34

Optimality test is applicable to a F.S. consisting of m+n-1= allocations in independent position.

Ans=Rs. 76

THANK YOU

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References:

1. https://www.slideshare.net/VishalHotchandani2/transportation-problems-183454172
2. Optimization Techniques for Engineering by Nilama Gupta