Advance Engineering Mathematics(AEM)

## Branch :Information Technology, Sem:III<sup>rd</sup>



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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 <u>Mo</u>dified <u>Distribution (MODI) / u-v</u> <u>method – Transportation</u> Problem

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**Optimality Test** 

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

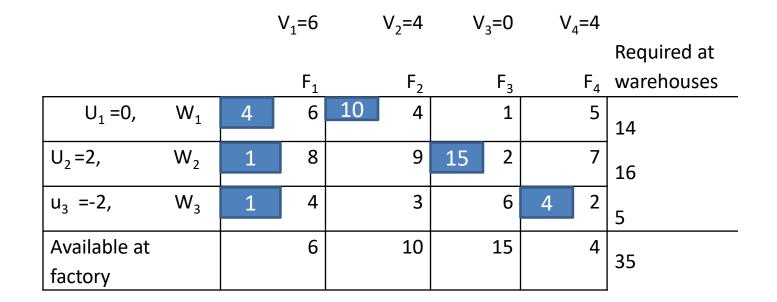
Remember: We need m+n-1 allocations in independent positions to start the Optimality test. Q3. A company has four factories F1,  $F_2$ ,  $F_3 F_4$ , from which is supplies to three warehouses  $W_1$ ,  $W_2$ ,  $W_3$ . Determine the optimal transportation plan from the following data giving the factories to warehouses shifting costs. Quantities available at each factory and quantities at each warehouse.

F1F2F3F4Required atwarehouses

W <sub>1</sub>	6	4	1	5	14
W <sub>2</sub>	8	9	2	7	16
W <sub>3</sub>	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

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**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

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

$$\begin{array}{cccc} D_{13}=1-(0+0)=1, & D_{14}=5-(0+4)=1, \\ & D_{22}=9-(2+4)=3, & D_{24}=7-(2+4)=1, \\ & D_{32}=3-(-2+4)=1 & , D_{33}=6-(-2+0)=8, \end{array}$$

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

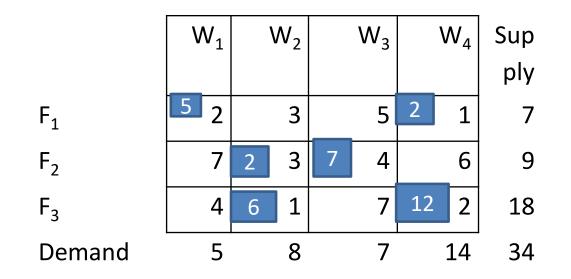
Thus the optimal solution is

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Cost =24+ 40+8+30+4+8=Rs. 114
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Q4. Solve the transportation problem for which the cost, origin availabilities and destination requirement are given below:

	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	$W_4$	Supply
F <sub>1</sub>	2	3	5	1	7
F <sub>2</sub>	7	3	4	6	9
F <sub>3</sub>	4	1	7	2	18
Demand	5	8	7	14	34

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



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

# THANK YOU

### References:

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