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.

Assignment Problems:

Q1. Four different jobs can be done on four different machines. The matrix below gives the cost in rupees of producing job i on machine j. How should the jobs be assigned to the various machines so that the total cost is minimized.

		M_1	M_2	M_3	M_4
Jobs	J_1	12	30	21	15
	J_2	18	33	9	31
	J_3	44	25	24	21
	J_4	23	30	28	14

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Solution :

Step 1:

Subtracting smallest element of each row from the other elements of the row, we get

	M_1	M_2	M_3	M_4
J_1	0	18	9	3
J_2	9	24	0	22
J_3	23	4	3	0
J_4	9	16	14	0

(ii) Subtract, smallest element of each column, from the other elements of the column we get

	M_1	M_2	M_3	M_4
J_1	0	14	9	3
J_2	9	20	0	22
J_3	23	0	3	0
J_4	9	12	14	0

Step 2:Now we make the assignment using step 2.

	M_1	M_2	M_3	M_4
J_1	0	14	9	3
J_2	9	20	0	22
J_3	23	0	3	0
J_4	9	12	14	0

Example 2. A Machine Tool Company decides to make four sub – assemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is determined by the bids submitted by each contractor and Shown in table below in hundreds of rupees. Assign the different subassemblies to contractors so as to minimize the total cost.

		Contractors			
		1	2	3	4
Sub-assemblies	1	15	13	14	17
	2	11	12	15	13
	3	13	12	10	11
	4	15	17	14	16

Solution : Subtracting the smallest element of each row from the other elements of the row.

		Contractors			
		1	2	3	4
Sub-assemblies	1	2	0	1	4
	2	0	1	4	2
	3	3	2	0	1
	4	1	3	0	2

II. Subtract, smallest element of each column from the other elements of the column.

		Contractors			
		1	2	3	4
Sub-assemblies	1	2	0	1	3
	2	0	1	4	1
	3	3	2	0	0
	4	1	3	0	1

Step II – Now we make the assignment according the rule.

		Contractors			
		1	2	3	4
Sub-assemblies	1	2	0	1	3
	2	0	1	4	1
	3	3	2	~~0~~	0
	4	1	3	0	1

The optimal assignment has been made.

Thus, the minimum total cost = Rs. (13 x 1 +11 x 1 + 11 x1 + 14 x1) x 100

= Rs. 4900/-

And the optimal assignment policy is

Sub-assemblies		**Contractors**
1	→	2
2	→	1
3	→	4
4	→	3

Example 3 : Solve the minimum assignment problem represented by the following matrix.

	I	II	III	IV	V	VI
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

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Subtract, smallest element of each row from the other elements of the row.

	I	II	III	IV	V	VI
A	0	13	49	2	10	18
B	0	35	29	7	20	5
C	13	0	63	9	17	5
D	47	15	0	22	12	5
E	25	0	46	11	14	7
F	0	53	50	28	14	25

(ii) Subtract, smallest element of each column from the other elements of the column.

	I	II	III	IV	V	VI
A	0	13	49	0	0	13
B	0	35	29	5	10	0
C	13	0	63	7	7	0
D	47	15	0	20	2	0
E	25	0	46	9	4	2
F	0	53	50	26	4	20

Now we given the assignment in usual manner and get the following:

- Since row 3 and column 5 have no assignment, we proceed to the next step
- Step 3 : Draw the lines according to step 3 of the algorithm. All the zeros will be covered by these lines at least once. These are minimum number of lines through all the zeros.
- Step 4 : Now the smallest of the elements which do not have a line through them is 4. Subtract 4 from all the elements that do not have a line through them and add to every element that lies at the intersection of two lines. Leave the remaining elements unchanged.
- Step 5. Repeat the step 2, we get the following table with assignment using step 4.

Now we given the assignment in usual manner and get the following

	I	II	III	IV	V	VI
A	4	17	49	0	0	17
B	0	35	25	1	6	0
C	13	0	59	3	3	0
D	51	19	0	20	2	4
E	25	0	42	5	0	2
F	0	53	46	22	0	20

Optimal Assignment:

A	IV
B	I
C	VI
D	III
E	II
F	V

Minimum cost = 11 + 43 +33 +37 + 11+17 = 142

THANK YOU

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