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:

Q4. A national truck rental service has a surplus of one truck in each of the cities 1,2,3,4,5 and 6: and a deficit of one truck in each of the cities 7,8,9,10,11 and 12. The distance (in Kms) between the cities with a surplus and the cities with a deficit are displayed below:

	7	8	9	10	11	12
1	31	62	29	42	15	41
2	12	19	39	55	71	40
3	17	29	50	41	22	22
4	35	40	38	42	27	33
5	19	30	29	16	20	23
6	72	30	30	50	41	20
7						

How should trucks be dispersed so as to minimize the total distance travelled?

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Solution :

Step 1:

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

	7	8	9	10	11	12
1	16	47	14	27	0	26
2	0	7	27	43	59	28
3	0	12	33	24	5	5
4	8	13	11	15	0	6
5	3	14	13	0	4	7
6						
7	52	10	10	30	21	0

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

	7	8	9	10	11	12
1	16	40	4	27	0	26
2	0	0	15	43	59	28
3	0	5	23	24	5	5
4	8	6	1	15	0	6
5	3	7	3	0	4	7
6	52	3	0	30	21	0

Step 2:Fourth row and sixth column do not have any assignment, so we draw the minimum number of lines to cover all zeroes.

	7	8	9	10	11	12
1	16	40	4	27	0	26
2	0	0	15	43	59	28
3	0	5	23	24	5	5
4	8	6	1	15	0	6
5	3	7	3	0	4	7
6	52	3	0	30	21	0
7						

We get the following matrix:

	7	8	9	10	11	12
1	15	39	3	26	0	25
2	0	0	15	43	60	28
3	0	5	23	24	6	5
4	7	5	0	14	0	5
5	3	7	3	0	5	7
6	52	3	0	30	31	0
7						

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The optimal assignment has been made.

1 → 11

2 → 8

3 → 17

4 → 9

5 → 10

6 → 12

The distance traveled= 15+19+17+38+16+20

= 125 miles

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Example 5 : Solve the assignment problem :

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

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To Convert the Maximization Problem to Minimization Problem:

Q6.A company has a team of four salesperson and there are four districts where the company wants to start its business. After taking into account the capabilities of salesmen and nature of districts the company estimates that the profit per day in rupees for each sales man for each district is as below :

	I	II	III	IV
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

Find the assignment of salesmen to various districts which will yield maximum profit?

Sol:

	I	II	III	IV
A	-16	-10	-14	-11
B	-14	-11	-15	-15
C	-15	-15	-13	-12
D	-13	-12	-14	-15

Further, solve as previous Question.

And: Total profit = 61

Assignment problem with Non Squaring Matrix:

Q7. A company has four machines on which to do three jobs. Each job can be assigned to one machine. The cost of each job on each machine is given in the following table.

	I	II	III	IV
A	18	24	28	32
B	8	13	17	19
C	10	15	19	22

What are the job assignment which will be minimize the cost?

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Sol. Since the given matrix is not square, we make it square by adding a dummy row D

	I	II	III	IV
A	18	24	28	32
B	8	13	17	19
C	10	15	19	22
D	0	0	0	0

Further, solve as previous Question.

Q8. Assign four trucks 1,2,3.4 to vacant spaces 7,8,9,10,11,12 so that the distance travelled is minimized. The matrix below show the distance.

	1	2	3	4
7	4	7	3	7
8	8	2	5	5
9	4	9	6	9
10	7	5	4	8
11	6	3	5	4
12	6	8	7	3

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Sol. Since the given matrix is not square, we make it square by adding a dummy column 5 and 6.

	1	2	3	4	5	6
7	4	7	3	7	0	0
8	8	2	5	5	0	0
9	4	9	6	9	0	0
10	7	5	4	8	0	0
11	6	3	5	4	0	0
12	6	8	7	3	0	0

Further, solve as previous Question.

Ans: Z_{min}= 12

THANK YOU

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