Problem Sheet 4
(Assignment Problem)

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1. A computer center has got three expert programmers. The center needs three application programs to be developed. The head of the computer center, after studying carefully the programs to be developed, estimates the computer time in minutes required by the experts to the application programs as follows:

	A	B	C
1	120	100	80
2	70	90	110
3	110	140	120

   Assign the programmers (1, 2, and 3) to the programs (A, B, and C) in such a way that the total computer time is least.

2. One car is available at each of the stations 1, 2, 3, 4, 5, and 6, and one car is required at each of the stations 7, 8, 9, 10, 11, and 12. The distances between the various stations are given in the matrix below. How should the cars be dispatched so as to minimize the total mileage covered?

	7	8	9	10	11	12
1	41	72	39	52	25	51
2	22	29	49	65	81	50
3	27	39	60	51	32	32
4	45	50	48	52	37	43
5	29	40	39	26	30	33
6	82	40	40	60	51	30

3. Use Hungarian method to solve the following cost-minimizing assignment problem:

	1	2	3	4
I	20	22	28	15
II	16	20	12	13
III	19	23	14	25
IV	10	16	12	10

4. Four salesmen are to be assigned to four districts. Estimates of the sales revenue in hundreds of Rs. for sale are as below:

	A	B	C	D
1	320	350	400	280
2	400	250	300	220
3	420	270	340	300
4	250	390	410	350

   Give the assignment pattern that maximizes the sales revenue.

5. Use the Hungarian method to find which of the two jobs should be left undone when each of the 4 persons will do only one job in the following cost minimizing assignment problem:

	J_1	J_2	J_3	J_4	J_5	J_6
P_1	10	9	11	12	8	5
P_2	12	10	9	11	9	4
P_3	8	11	10	7	12	6
P_4	10	7	8	10	10	5

6. Five operators have to be assigned to five machines. The assignment costs are given in the table below:

	I	II	III	IV	V
A	5	5	–	2	6
B	7	4	2	3	4
C	9	3	5	–	3
D	7	2	6	7	2
E	6	5	7	9	1

   Operator A cannot operate machine III, and operator C cannot operate machine IV. Find the optimal assignment schedule.

7. The owner of a small machine shop has four persons available to assign to jobs for the day. Five jobs are offered with the expected profit in rupees for each person on each job being as follows:

	A	B	C	D	E
1	6:20	7:80	5:00	10:10	8:20
2	7:10	8:40	6:10	7:30	5:90
3	8:70	9:20	11:10	7:10	8:10
4	4:80	6:40	8:70	7:70	8:00

8. A company is faced with the problem of assigning 4 machines to 6 different jobs (one machine to one job only). The profits are estimated as follows:

	A	B	C	D
1	3	6	2	6
2	7	1	4	4
3	3	8	5	8
4	6	4	3	7
5	5	2	4	3
6	5	7	6	4

   Solve the problem to maximize the total profit.