

I.E.2001 OPERATIONS RESEARCH
(Homework Assignment 8: Due April 2, 2020)

Question 1

Question 1 on page 398 of the text (five employees & four jobs...); use the Hungarian algorithm.

Group A

1 Five employees are available to perform four jobs. The time it takes each person to perform each job is given in Table 50. Determine the assignment of employees to jobs that minimizes the total time required to perform the four jobs.



TABLE 50

Person	Time (hours)			
	Job 1	Job 2	Job 3	Job 4
1	22	18	30	18
2	18	—	27	22
3	26	20	28	28
4	16	22	—	14
5	21	—	25	28

Note: Dashes indicate person cannot do that particular job.

Question 2:

Question 28, page 411 of the text (professors...); use the Hungarian algorithm.

28 Three professors must be assigned to teach six sections of finance. Each professor must teach two sections of finance, and each has ranked the six time periods during which finance is taught, as shown in Table 88. A ranking of 10 means that the professor wants to teach that time, and a ranking of 1 means that he or she does not want to teach at that time. Determine an assignment of professors to sections that will maximize the total satisfaction of the professors.

Prof.	9AM	10AM	11AM	1PM	2PM	3PM
1	8	7	6	5	7	6
2	9	9	8	8	4	4
3	7	6	9	6	9	9

Question 3

Question 1 at the end of Section 9.2 on pages 502 of the text (Coach Night). **Model only the restrictions in 1, 2, and 5.** Don't solve – just formulate...

1 Coach Night is trying to choose the starting lineup for the basketball team. The team consists of seven players who have been rated (on a scale of 1 = poor to 3 = excellent) according to their ball-handling, shooting, rebounding, and defensive abilities. The positions that each player is allowed to play and the player's abilities are listed in Table 9.

The five-player starting lineup must satisfy the following restrictions:

- 1 At least 4 members must be able to play guard, at least 2 members must be able to play forward, and at least 1 member must be able to play center.
- 2 The average ball-handling, shooting, and rebounding level of the starting lineup must be at least 2.
- 3 If player 3 starts, then player 6 cannot start.
- 4 If player 1 starts, then players 4 and 5 must both start.
- 5 Either player 2 or player 3 must start.

Given these constraints, Coach Night wants to maximize the total defensive ability of the starting team. Formulate an IP that will help him choose his starting team.

TABLE 9

Player	Position	Ball-Handling	Shooting	Rebounding	Defense
1	G	3	3	1	3
2	C	2	1	3	2
3	G-F	2	3	2	2
4	F-C	1	3	3	1
5	G-F	3	3	3	3
6	F-C	3	1	2	3
7	G-F	3	2	2	1

Question 4

Question 3, at the end of Section 9.2 on pages 502-503 of the text (manufacturer); also shown below. Don't solve – just formulate...

A manufacturer can sell product 1 at a profit of \$2/unit and product 2 at a profit of \$5/unit. 3 units of raw material are needed to make one unit of product 1, and 6 units of raw material are needed to make one unit of product 2. A total of 120 units of raw material are available. If any amount of product 1 is produced there is a setup cost of \$10, and if any amount of product 2 is produced there is a setup cost of \$20. Formulate an IP to maximize profits.

Question 5

Question 13 (Glueco), at the end of Section 9.2 on page 503 of the text. Just formulate...

13 Glueco produces three types of glue on two different production lines. Each line can be utilized by up to seven workers at a time. Workers are paid \$500 per week on production line 1, and \$900 per week on production line 2. A week of production costs \$1,000 to set up production line 1 and \$2,000 to set up production line 2. During a week on a production line, each worker produces the number of units of glue shown in Table 12. Each week, at least 120 units of glue 1, at least 150 units of glue 2, and at least 200 units of glue 3 must be produced. Formulate an IP to minimize the total cost of meeting weekly demands.