

IE375 Fall 2020 Homework V - Due: December 25 (Friday 17:00)

- **Homework V is 2%. Make sure that you review course material before you start. Cite sources used if any.**

- **Grading Policy:** The homework grades will not be only based on the correctness of the answers provided, but on the perceived degree of effort on the returned assignment. This means that even without obtaining the correct answers one can obtain full credit. The grade scale will be “2” (full effort, all questions); “1” (some effort or full effort, some questions); “0” (no effort or no submission). The submissions that exceed expectations may get a bonus – grade will be “3” (extra effort). Note that “2” corresponds to a grade out of 100% - 2% of the overall grade in this case. Late submissions will not be accepted.
- The grading scale for each question is 2 points (full effort), 1 point (some effort), and 0 (no effort or no submission). Total points that would lead to your overall HW grade are given below:

Total Points	HW Grade
4+	3
3-4	2
1-2	1
0	0

- **Academic Dishonesty (taken from IE375 Course Information):** Academic misconduct is not tolerated, and violations will be treated in accordance with the University policy. For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- **Submission Information:** Please send your solution as a pdf file to IE375 Course TA Egemen Elver. Make sure that pdf contains your name, and you mail it from your mail account available in STARS. Also note that if your mail is different than the one provided by Bilkent University, there is a chance that it will be received after the due time.
- **More Information on Questions: What is expected? How to study?**
- To answer the questions, make sure that you understand the material presented during the course, as well as you have already the reading from the textbook. Homework V is mostly made up of computational questions. Nevertheless, they have a conceptual part as well as you must understand how to approach the solution. Make sure you understand the questions.
- **One final remark:** In the exams, please get used to receiving question types that you have not seen before. One useful purpose of homework and exercises is to cover the “routine” so that you can go beyond that during the exams, and elsewhere.

- 1) Eight jobs are to be processed through a single machine. The processing times and the due dates are given below:

Job	1	2	3	4	5	6	7	8
Processing time	2	3	2	1	4	3	2	2
Due date	5	4	13	6	12	10	15	19

Furthermore, assume that the following precedence relationships must be satisfied:

Job2 --> Job6 --> Job3 and Job1 --> Job4 --> Job7--> Job8 (meaning Job2 should be finished before Job 6, etc.)

Find the sequence that minimizes the maximum tardiness, and compute maximum tardiness value that resulted from the sequence.

- 2) Consider an auto body shop. Each car with damage should be first refitted and then repainted before being delivered to the customer. Currently the shop has 5 cars to be repaired with various levels of damages and thus require different refitting and repairing times. These processing times and the promised due dates are given below:

Car	Required refitting time (hours)	Required repainting time (hours)	Due date (hours)
A	4	5	42
B	16	14	40
C	8	7	70
D	12	11	43
E	3	9	16

Use Gantt charts to make sure that you make the computations correctly. (This would be a good way of not losing the whole grade because of computational mistakes.)

- There is a single worker who is responsible for both refitting and repainting. The worker completes one car and then works on the next. What order should the shop repair these cars to minimize the maximum tardiness? What is the minimum maximum tardiness?
- Now assume that there are two workers in the shop. First worker is responsible for refitting and the second worker is responsible for repainting. What order should the shop repair these cars to minimize the makespan? What is the minimum makespan?
- Compute the makespan value for the solution obtained in part a), and the maximum tardiness value for the solution obtained in part b). Compare and comment the differences in makespan and maximum tardiness values for single or two-worker cases.