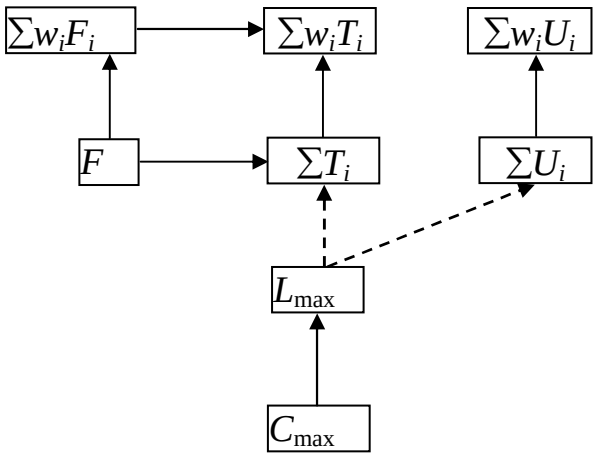
Exercises I.

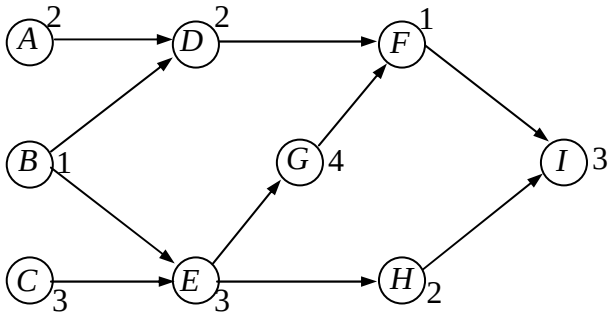
Exercise 1.
Two typists with the same qualifications work in an office. The director brought three 5-page letters to be copied. Your task is to construct an optimal schedule minimizing $C_{\max}$ in both preemptive and non-preemptive case. Describe these problems in the 3-field notation. Compute ΣC_j and F for the schedules you have obtained.

Exercise 2.
Ten professors of the ETI Faculty organize the last-chance exams of 10 different courses for a group of students who do not passed at least three exams. The exams are oral, are taken individually with each student and take 15 minutes each. Our task is to plan the exams timetable to complete all of them as soon as possible. Formulate this problem in the terminology of task scheduling. Describe the problem in the 3-field notation.

Exercise 3.
Prove that the optimization problems of minimizing the following criteria can be reduced as depicted in the figure below.



Exercise 4.
Schedule a set of tasks with the following precedence constraints to minimize C_{max}. Find the slack time for each task. Is ΣC_j minimized, too?



Exercise 5.
Consider a problem of scheduling independent, non-preemptive tasks with p_j=1 on m=2 processors to minimize C_{max}. The tasks require additional resources R={R_1,...,R_k}. Suppose that a matrix $R_{ij} \in$ {0,1} is given, where R_{ij}=1 if and only if T_j requires R_i. Construct a polynomial-time algorithm by reducing the problem to graph-matching problem.
Exercise 6.
Prove that the problem of Exercise 5 becomes NP-hard if the number of processors $m \geq n$.