University Center of Mila
2nd year bachelor's degree in computer science
Course: Operating Systems 1

Tutorial Series No. 1

Exercise 1:
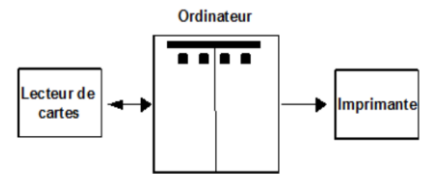A computer needs to process a set of jobs. The characteristics of the computer and the standard job are as follows:
- Card reader speed: 1000 cards/min
- Printer speed: 1000 lines/min
Standard Job:
Phase 1: Reading 300 cards (programs and data),
Phase 2: Computing for 1 min,
Phase 3: Printing 500 lines.
We are interested in studying the evolution of computer systems. We consider the following configuration:

a) To study the performance of this configuration, we choose two parameters to account for the system's performance.
- Processor utilization: N = fraction of time (percentage) dedicated by the processor to executing jobs.
- Job throughput: D = number of jobs executed per unit of time (hour).
Q) Justify the choice of parameters N and D?

b) We assume that the system is managed under a single user mode. The system is fully allocated to each user for a duration of 15 minutes.
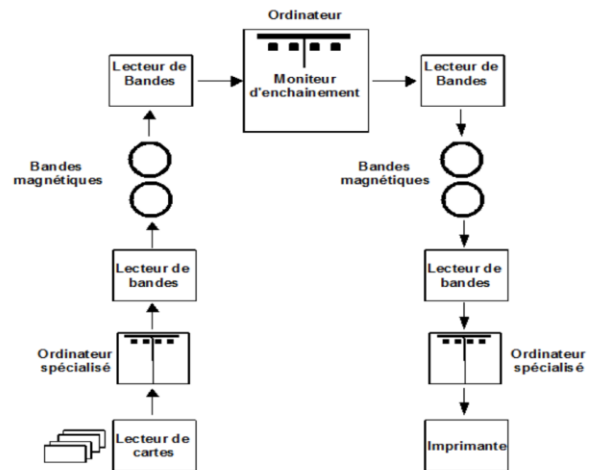**Q1**) What are the values of N and D?
Q2) Now, the system is managed by the Job Monitor. Calculate the new values of N and D?

c) We now use the following batch processing configuration:
Suppose the batch includes 50 jobs and the Magnetic tape transfer time is 5 minutes.
Q1) What is the total execution time of a batch?
Q2) What is the minimum waiting time for a job?

Exercise 2:
We are interested in the execution on a single-processor configuration (CPU, main memory, one peripheral device) of the following three programs P1, P2, P3, which arrive in order: P1, P2, P3:

P1	P2	P3
- 5 CPU time units.	- 1 CPU time unit.	- 1 I/O time unit.
- 2 I/O time units.	- 4 I/O time units.	- 4 CPU time units.
- 3 CPU time units.		

Q1) Assuming the system control task time is negligible (can be ignored) regardless of its nature, provide the execution diagram of the programs in the three execution modes:
Monoprogramming, multiprogramming, and time-sharing (with a quantum of 2-time units).

Q2) Calculate the individual and average response times in each mode.
Q3) Now assume we have two I/O devices. Reconsider questions 1 and 2.