MP305 Practical 2022/2023 - Activity Networks

- The `Python` notebook `Activity_Network` that can be accessed via any web browser. See the **MP305 Blackboard** web page for details and instructions.
- Solutions to **all** questions with **(*)** have to be submitted as a pdf document through Blackboard. You must include some text commentary (in Python notebook Markdown cells) to explain your answers to the questions asked.
- This practical is worth 4% of your final grade.

1. Analyse the chemical production problem discussed in class as given in the `Python` notebook `Activity_Network`
2. **(*)** Find the critical path and the minimal completion time for the following assembly problem with 10 activities (A-J):

   Activity A precedes activity J and the completion time is 7.

   Activity B precedes activity J and the completion time is 7.

   Activity C precedes activity J and the completion time is 7.

   Activity D precedes activities C, E, F and J and the completion time is 2.

   Activity E precedes activities C, H, I and J and the completion time is 3.

   Activity F precedes activities G, H and I and the completion time is 2.

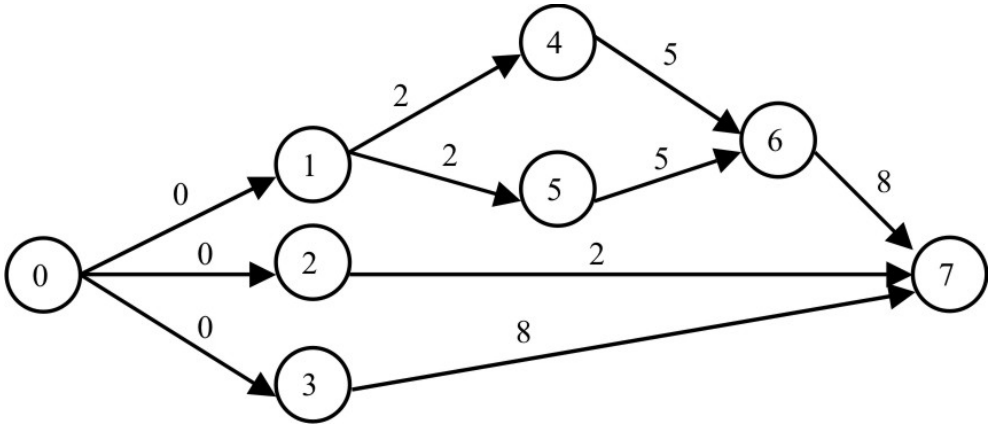
   Activity G precedes activities H and I and the completion time is 2.

   Activity H precedes Finish and the completion time is 8.

   Activity I precedes Finish and the completion time is 8.

   Activity J precedes Finish and the completion time is 18.

3. Investigate the scheduling of 2 or 3 workers to the example



discussed in class using the critical path and protection scheduling using the Python functions `CritSchedule(G,T,Nw)`and `ProtSchedule(G,T,Nw)`. With the earliest and latest starting times found verify the scheduling found by hand.

4. **(*)** A large computer program consists of a number of modules (or subroutines) M_1, M_2, M_3, M_4, M_5, M_6, M_7 and M_8. Each module M_i takes a time T_i (in minutes) to complete and their completion depend of some preceding modules as follows:

Module	M_1	M_2	M_3	M_4	M_5	M_6	M_7	M_8
T_i	2	2	3	2	2	6	3	4
Preceding	none	none	M_1	M_1, M_2	M_1, M_2	M_3, M_4, M_5	M_3, M_4, M_5	M_3, M_7

   (a) Construct the activity network for this system with standard labeling.

   (b) Find the critical path minimal completion time assuming that a sufficient number of parallel processors are available. What are the earliest and latest starting times for each module?

   (c) Find the minimal completion time assuming that only **two** parallel processors are available using the critical path or protection scheme scheduling strategies. What is the average computing time per processor?

   (d) A programmer realizes that part of **either** module M_3 **or** M_4 can placed in module M_6 at a saving of 1 minute in for T_3 **or** T_4 but at the expense of 1 minute further in T_6. What would you recommend for maximum efficiency given that you have only two parallel processors?