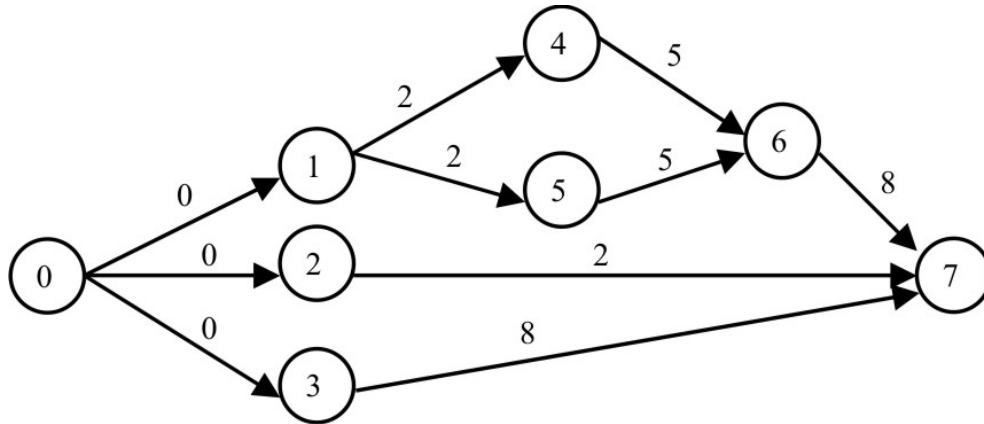


MP305 Practical 2021/2022 - Activity Networks

- 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

- Construct the activity network for this system with standard labeling.
- 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?
- 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?
- A programmer realizes that part of **either** module M_3 **or** M_4 can be 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?