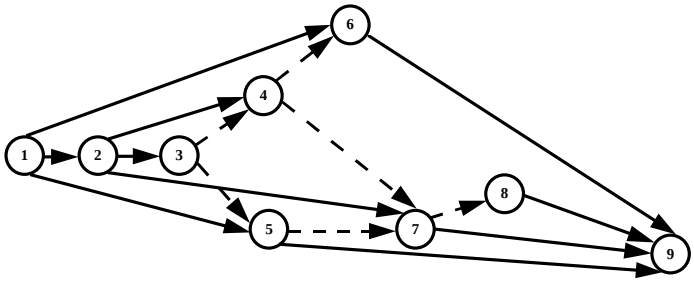
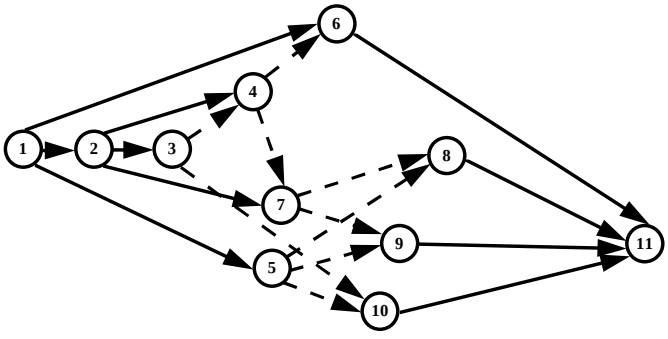
Homework 1

1. Draw a project network in activity-on-the-node format using the data given below:

Activity	Duration	Predecessor(s)
a	17	-
b	3	-
c	20	-
d	11	*b*
e	2	*b*
f	12	*b*
g	7	*a, d, e*
h	2	*c, d, e, f*
i	10	*c, d, e, f*
j	6	*c, e*

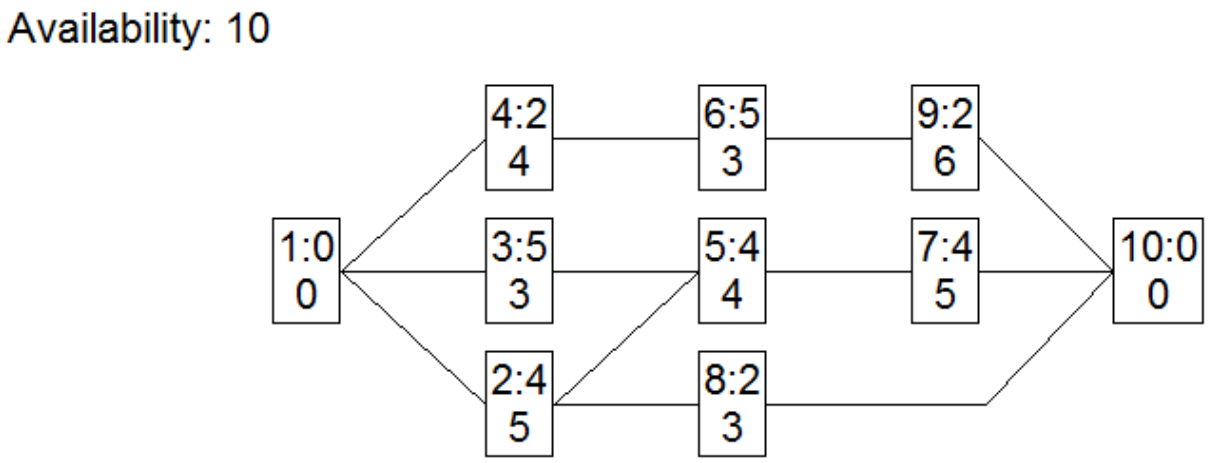
We have transformed the network into two networks (see below) in activity-on-the-arc representation that only differ in the position and number of dummy activities.





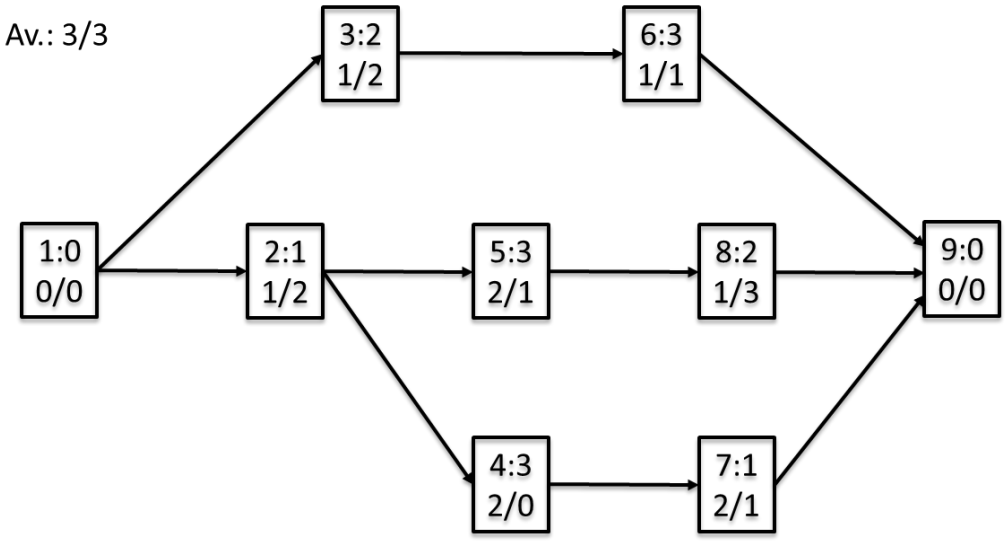
Compute for each activity in each *AoA* network the total slack, safety slack, free slack and independent slack values. Try to find out why some of the slack values differ. Compare the slack values with the slack values obtained for the network in *AoN* representation. What are your conclusions?

2. Consider the following project network in activity-on-the-node representation:



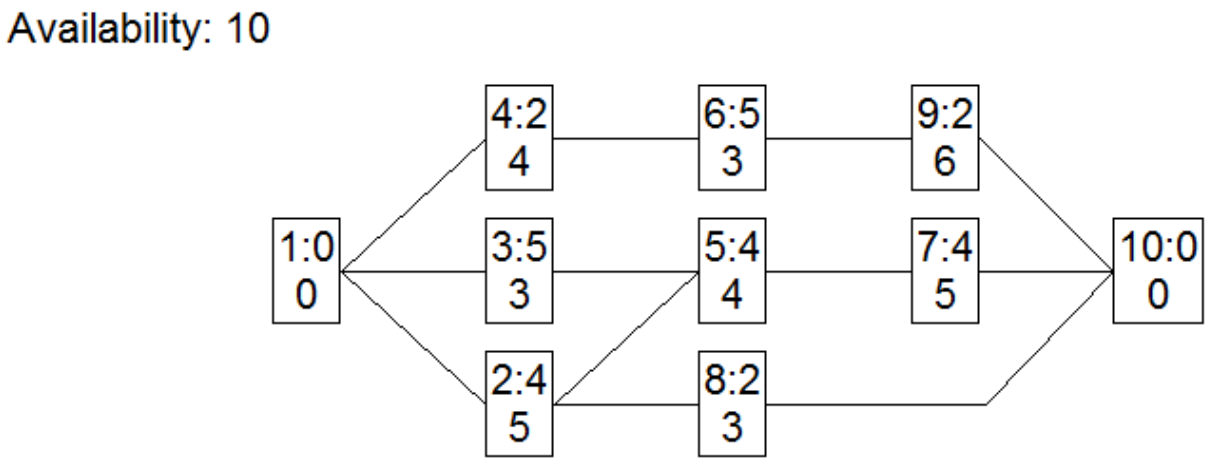
Assuming that a feasible schedule for this project can be found with a makespan of 16, construct a mathematical programming formulation that will find the optimal schedule and that is based on time-indexed pulse variables.

3. Consider the following project network in activity-on-the-node representation:



The precedence relations are of the finish-start, zero-lag type. Activity 1 and activity 9 are dummy activities. Two renewable resource types have been allocated to the project with constant per-period availabilities of 3 and 3 respectively. Compute a *critical path based lower bound* and a *critical sequence based lower bound* on the optimal duration of the project. Explain your computational steps in sufficient detail.

4. Consider the following project network in activity-on-the-node representation:



Apply the DH-procedure in order to find the optimal makespan for this project.