Examen Project Management and scheduling Januari 2022

Question 1: Calculate for a project where he says that activity 3 is delayed (receive an AoN) -> need to compute a new critical path.
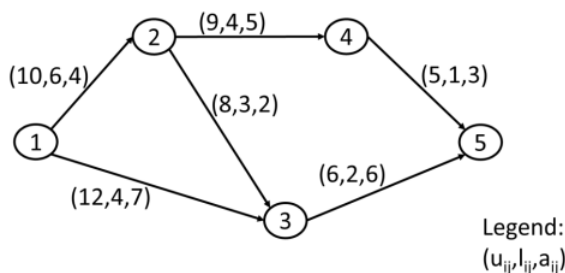
-Critical sequence bound = maxiNC{z+di -ei }

$$lb_r = \max_k \left\lceil \frac{\sum_i r_{ik} \times d_i}{a_k} \right\rceil$$

-Resource-based bound

Question 2: Time/cost trade-off problem: reduce the length of the project at the cheapest cost (labeling procedure of Fulkerson and Kelley).

Receive such a kind of AoA representation (like in Homework 2 2021) and you need to reduce to a project length of 10.

Legend:
(u_{ij}, l_{ij}, a_{ij})

Question 3: Starting time criticality (STC) heuristic

Receive AoN representation and a graph that represents the precedence relation with the resource flow network, table to calculate the probabilities and the weight of the different activities. Need to calculate the stc and improve the project

Question 4: 5 small questions (multiple choice or where you only need to fill in the answer) Don't remember the exact order
  1) How many minimal forbidden sets are in this project ? (you receive an AoN representation)
  2) Need to improve the list with binary operators: one-point crossover with priority list. You get the list of the father and the list of the mother x=3, compute the daughter's list.
  3) Mixed-Integer Linear programming RCPSP formulations:
     What would the precedence constraint look like with the on/off time-indexed step variables? You get the activity start constraints (like the ones below)

$$x_{21} + x_{22} + x_{23} + x_{24} + x_{25} = 1$$
$$x_{31} + x_{32} + x_{33} = 1$$
$$x_{44} + x_{45} + x_{46} + x_{47} + x_{48} = 1$$
$$x_{55} + x_{56} + x_{57} = 1$$

(activity start constraints)

Get 5 choices and need to indicate the ones that are correct (like the ones below)

$$t = 6 : x_{76} \leq x_{52}$$
$$t = 7 : x_{77} \leq x_{53}$$
$$t = 8 : x_{78} \leq x_{54}$$
$$t = 9 : x_{79} \leq x_{55}$$
$$t = 10 : x_{7,10} \leq x_{55} + x_{56}$$

4) I don't remember
5) smth with the robust project scheduling