Example exam for the Mastermath course 'Scheduling' 2019

Question 1:

Consider problem $1|r_j, p_j = 1|\ L_{max}$. Proof that this problem can be solved by Horns' rule:

- Schedule jobs starting at the smallest r_j-value,
- At any time schedule an available job with smallest due date.

Hint: you may use an interchange argument.

Question 2:

Proof that problem $1||\sum w_j\, T_j$ is strongly NP hard.

Question 3:

Consider the following instance of problem $O2||C_{max}$:

$$n = 6,\ \ p = \begin{pmatrix} 2 & 5 & 5 & 1 & 3 & 3 \\ 4 & 4 & 2 & 6 & 4 & 3 \end{pmatrix}.$$

Apply the presented optimal algorithm for problem $O2||C_{max}$ to this instance. Give the results of the different steps and the optimal solution.

Question 4:

Consider problem $1||\sum w_j\, U_j$, which is NP-hard. Assume that it is known which jobs finish before or at their due date and which jobs finish late in an optimal schedule. How can you use this information to find an optimal solution?

Question 5: *(indication 300 words)*

Give a general description of the Crew Planning problem at Netherlands Railways. Describe the main (sub)problems including objectives and constraints and the used solution approaches.