1 Book 8.4: Resource Allocation

1.1 Mathematical Formulation

Given an input of n processes, $P = \{p_1, p_2, ..., p_n\}$, and a set of m resources, $R = \{r_1, r_2, ..., r_m\}$, each process requires a set of resources $R^*, R^* \subseteq R$. Each process in required active iff every resource $r \in R^*$ is allocated to it, however each resource can only be used once. Given a number $k > 0$, determine if resources $\in R$ can be allocated so that at least k processes $\in P$ will be active. For the following cases, give a polynomial algorithm or proove it is NP-Complete.

1. General Case i.e. $k > 0$

2. $k = 2$

3. Each resource can be allocated a maximum of 2 times

1.2 Solution

Important Confusing Data Structures:

- type **name** :   explaination

  The main functionality of

Algorithm 1 Method
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  procedure NAME(..,..,)

1.3 Correctness

Proposition 1.
  propose

Proof.
  Using the fact that   □

1.4 Analysis

For the following analysis, we will say that..

Proposition 2. *The space complexity of this algorithm is $O(..)$*

Proof.
  This is due to the fact that all of our data is stored in data structures:

- <u>cause</u>: reason $\implies$ *complexity*

Giving us a space complexity of **O(..)**

$\square$

Proposition 3. *The time complexity of this algorithm is* ***O(..)***

Proof. This is the case because our algorithm...

Giving us a time complexity of **O(..)**

$\square$

1.5   An Example