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Instruction group:

- ☐ Group Erik de Vink, AUD 9
- ☐ Group Jerry den Hartog, AUD 10
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Interim test Discrete Structures 2IT50, October 19, 2016

This interim test is the third of three, of which the best two count for 30% of the final grade. It consists of three problems with the indicated weights.

In giving proofs you may use theorems and lemmas from the lecture notes (not exercises), as long as you indicate that you use them.

The problems may be solved either in English or in Dutch, please write your answer on this paper in the indicated boxes.

This test will be graded according the given percentages.

Problem 1.

Consider the natural numbers with the divisibility order.

a. (15 %) Draw the Hasse diagram of $\{x \in \mathbb{N} \mid 2 \leq x \leq 10\}$. Determine all elements that are neither minimal nor maximal in this set.

b. (15 %) Compute the supremum of $\{2, 3, 4, 6\}$.

Problem 2.

(35 %) Let $(U, \sqsubseteq)$ be a lattice, and $x, y, z, w \in U$ satisfy $y \sqsubseteq z$. Prove that

$$x \sqcap y \sqsubseteq (x \sqcup w) \sqcap z.$$

Problem 3.

a. (20 %) Let A be a finite set. Let $F : A \to A$ be a permutation satisfying $F(a) = d$, $F(b) = e$, $F(c) = b$, $F(d) = a$, $F(e) = c$ for some $a, b, c, d, e \in A$, all distinct. Prove that the order of F is at least 6.

b. (15 %) Give an example of a finite set A and a permutation $F : A \to A$ satisfying the same requirements as in part a, for which the order of F is strictly greater than 6.

(scrap paper)