Problem B1 (30 pts). (a) Give an NFA with five states and two $\epsilon$-transitions accepting the language $L = \{ab, aab, aba\}^*$.

(b) Convert the NFA of question (a) to a DFA.

Problem B2 (30 pts). Let $\Sigma = \{a, b\}$ and consider the language

$L = \{w \in \Sigma^* | w \text{ contains an odd number of } a\text{'s or an odd number of } b\text{'s}\}$.

Give a regular expression denoting $L$.

Hint: Start by constructing an NFA (or a DFA) for $L$. Then, use the node elimination algorithm and pay attention to symmetries.

Problem B3 (40 pts). Let $R$ be any regular language over some alphabet $\Sigma$. Prove that the language

$L = \{u \in \Sigma^* | \exists v \in \Sigma^*, uv \in R, |u| = |v|\}$

is regular.

TOTAL: 100 points