Problem Set 12

1. Consider the following acceptance condition in an ω-automata. The acceptance condition is given as a set $\mathcal{F} = \{F_1, \ldots, F_n\}$, where each F_i is a set of states. A run ρ is an accepting run iff $Inf(\rho) = F_i$ for some i. Lets call this acceptance condition a *Muller* acceptance condition. A deterministic ω-automata with the Muller condition is called a Deterministic Muller automata and denoted as DMA. Show that DMA $\subseteq$ NBA.
2. Show that DMAs are closed under union.
3. Show that the language accepted by a DMA can be written as a boolean combination of languages accepted by DBAs.
4. Compare ω-regular languages and languages $\subseteq \Sigma^\omega$ which are MSO-definable. Can you extend the MSO—finite automaton connection to MSO over infinite words—NBA? For example,
   - How will you write an MSO formula to capture infinitely many a's assuming $\Sigma = \{a, b\}$?
   - How will you write an MSO formula to capture the language where every even position has an a? Can you write this in FO over infinite words or using LTL?
   - How will you capture the Muller acceptance condition in MSO?
5. Discuss GNBAs intersection.
6. Discuss EF games. How does a game help in FO-definability? How does a game help in FO-non-definability?