# Homework 4

## Problem 1:

Consider relations with the following schemas and set of functional dependencies. Answer the following questions for each:

- what are the non-trivial FDs that follow from the given FD. Restrict yourself to FDs with single attributes on the right side?
- What are the closures of each non-empty subset of the attributes?
- What are the keys of the relation?
- What are the superkeys that are not keys?

20 pts (A) $R(A, B, C, D)$ and $\{AB \rightarrow C, C \rightarrow D, D \rightarrow A\}$

20 pts (B) $S(A, B, C, D)$ and $\{A \rightarrow B, B \rightarrow C, B \rightarrow D\}$

20 pts (C) $T(A, B, C, D)$ and $\{AB \rightarrow C, BC \rightarrow D, CD \rightarrow A, AD \rightarrow B\}$

20 pts (D) $U(A, B, C, D)$ and $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow A\}$

## Problem 2:

Assume a **bad** single table NavalWar1814, identify all functional dependencies:

20 pts

| Battle | Date | Navu | Ship | Type | Guns | Result |
|---|---|---|---|---|---|---|
| George Island | 1812-08-13 | USS | Essex | Light Frigatte | 32 | won |
| George Island | 1812-08-13 | HMS | Alert | Sloop | 20 | captured |
| Action off New Foundland | 1812-08-19 | USS | Constitution | Frigatte | 44 | won |
| Action off New Foundland | 1812-08-19 | HMS | Guerriere | Frigatte | 38 | sunk |
| … | … | … | … | … | … | |

What type of functional dependencies exist in this table? Can this table capture the renaming or naming after a predecessor of ships? If there is no renaming, what are the functional dependencies?