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COSC 4820

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Homework 3

**Question 2: [4 points]**  
No class of ships may have guns larger than 16-inch bore.

SELECT(bore >= 16){Classes} = \empty set\

**Question 3: [4 points]**  
If a class of ships has more than 9 guns, then their bore must be no larger than 14 inches.

SELECT(numGuns> 9 AND bore > 14){Classes} = \empty set\

**Question 4: [4 points]**  
No class may have more than two ships.

R1 = PROJECT(name, class){SELECT(name != class){Ships}}

R2 = R1

SELECT(R1.name != R2.name AND R1.class = R2.class){PRODUCT{R1, R2}}   
 = \empty set\

**Question 5: [4 points]**  
No country may have both battleships and battlecruisers.

RBS = PROJECT(country){SELECT(type = “bb”){classes}

RBC = PROJECT(country){SELECT(type = “bc”){classes}

JOIN{RBS, RBC} = \empty set\

**Question 6: [4 points]**  
No ship with more than 9 guns may be in a battle with a ship having fewer than 9 guns  
that was sunk.

RB = RENAME(RB)(name, battle, result){Outcomes}

RL = SELECT(numGUNS > 9){JOIN{Ships, Classes}}

RL = JOIN{RL, RB}

RS = SELECT(numGUNS < 9){JOIN{Ships, Classes}}

RS = JOIN{RS, RB}

THETA(RL.battle = RS.battle AND RS.result = “Sunk”){RL, RS} = \empty set\

**Questions about FD Rules**Let R(A, B, C, D, E, F ) be a relation and let T (K, L, M, N ) be another.  
AB → C, B → D, E → F are FD’s which hold for relation R  
K → M , L → M , M → N are FD’s which hold for relation T

**Question 7: [10 points]**  
Does AB → F hold for R? You must show the computed closure and explicitly answer  
the question.

AB+ = C (transitive, from AB)  
 = A (reflexive, from AB)  
 = B (reflexive, from AB)  
 = D (transitive, from B)  
 AB+ = CABD

AB -> F does NOT hold for R.

**Question 8: [5 points]**  
What are the keys for relation T ?

The key for relation T is ‘KL’ this is the minimal key.

**Question 9: [5 points]**  
What are the superkeys for relation T ?

The superkeys for relation T are ‘KL’, ‘KLM’, ‘KLN’, and ‘KLMN’

**Question 10: [5 points]**  
Does AB → D hold for relation R? Why or why not?

Because the closure for AB is {CABD} AB->D does hold. This is from B->D where B is a part of AB.

**Question 11: [5 points]**  
Give a minimal basis for relation R.

The minimal basis for relation R is {ABE} -> {A,B,C,D,E,F}.