Assignment 1 (Distributed Database Systems)
(due Thursday, June 12, 2003)

1. (5.1) Given relation EMP as in Figure 5.3, let p1: TITLE < “Programmer” and p2: TITLE > “Programmer” be two simple predicates. Assume that character strings have an order among them, based on the alphabetical order.
(a) Perform a horizontal fragmentation of relation EMP with respect to {p1, p2}.
(b) Explain why the resulting fragmentation (EMP1, EMP2) does not fulfil the correctness rules of fragmentation.
(c) Modify the predicates p1 and p2 so that they partition EMP obeying the correctness rules of fragmentation. To do this, modify the predicates, compose all minterm predicates and deduce the corresponding implication, and then perform a horizontal fragmentation of EMP based on these minterm predicates. Finally, show that the result has completeness, reconstruction and disjointness properties.

2. (5.5) Given relation PAY as in Figture 5.3, let p1: SAL < 30000 and p2: SAL ≥ 3000 be two simple predicates. Peroform a horizontal fragmentation of PAY with respect to these predicates to obtain PAY1, and PAY2. Using the fragmentation of PAY, perform further derived horizontal fragmentation for EMP. Show completeness, reconstruction, and disjointness of fragmentation of EMP.

3. (5.6) Let Q = {q1, q2, q3, q4, q5} be a set of queries, A = {A1, A2, A3, A4, A5} be a set of attributes, and S = {S1, S2, S3} be a set of sites. The following matrices describe the attribute usage values and the application access frequencies. Assume that access/execution for queries and sites, and that A1 is the key attribute. Use the bond energe and vertical partitioning algorithms to obtain a vertical fragmentation of the set of attributes in A.

	A1	A2	A3	A4	A5
q1	0	1	1	0	1
q2	1	1	1	0	1
q3	1	0	0	1	1
q4	0	0	1	0	0
q5	1	1	1	0	0

	S1	S2	S3
q1	10	20	0
q2	5	0	10
q3	0	35	5
q4	0	10	0
q5	0	15	0

4. (6.7) Using the assertion specification language of Chapter 6, express an integrity constraint which states that the duration spent in a project cannot exceed 48 months.