**Problem Set 6**

**Problem 1.** Consider the relation $E(Eno, Ename, Dname, Salary)$. Let the domain of $Dname$ be \{CS, EE, ..., History\} and domain of $Salary$ be the set of positive integers. The most frequent queries on $E$ use the set of simple predicates \{$Dname = History, Dname = CS, Salary >= 60000, Salary <= 30000$\}. Compute the primary horizontal fragments of $E$.

**Problem 2.** Consider the relations $P(Pno, Pname, Budget, Loc)$ and $A(Eno, Pno, Duration)$. Let $P$ be horizontally fragmented into $P_1 = \sigma_{Pno<100}(P)$ and $P_2 = \sigma_{Pno\geq100}(P)$; let $A$ be horizontally fragmented into $A_1 = \sigma_{Pno<50}(A); A_2 = \sigma_{50\leq Pno<100}(A); A_3 = \sigma_{Pno\geq100}(A)$. Transform the following SQL query into a reduced algebraic query tree:

```sql
SELECT Duration, Budget
FROM A, P
WHERE A.Pno = P.Pno AND P.Pname = "DB"
```

**Problem 3.** Consider the relations $E$, $P$ and $A$ as defined in the previous two problems. Let $P$ be horizontally fragmented into $P_1 = \sigma_{Pno<100}(P)$ and $P_2 = \sigma_{Pno\geq100}(P)$; let $E$ be vertically fragmented into $E_1 = \pi_{Eno,Ename,Salary}(E)$ and $E_2 = \pi_{Eno,Dname}(E)$. Let the horizontal fragmentation of $A$ be derived from that of $P$, based on the $Pno$ attribute (assume $Pno$ is the key of $P$). Reduce the following query:

```sql
SELECT Ename
FROM E, A, P
WHERE P.Pno = A.Pno AND E.Eno = A.Eno AND P.Loc = "Palo Alto"
```

**Problem 4.** Compute $k_0$ for the example shown in slide 20 of lecture 14. (Note: There was a typo in the originally handed out slides. The correction was announced in class - for site 2, the min should be 7 and not 10).