

Name: _____

This quiz is **open book, open notes**, but there can be no sharing of any material. Some questions in this quiz use the following tables: Packages, which hold information on package IDs, weights, and the account to which each package is to be charged, and Accounts, which holds the phone number and address for each account. We use $P(I, W, A)$ and $A(A, P, L, C)$ as short-hand for the schemas of the relations Packages and Accounts, respectively. As always, when asked for relational algebra or SQL expressions of queries, you must provide answers that work for all possible database instances, not just the example instance depicted below.

Packages

ID	Weight	Acct
MD101	1	19087
MD135	2	20948
DC001	5	93498
VA1098	20	19087

Accounts

Acct	Phone	Address	PostCode
19087	124.2693	111 First St	20901
20948	394.3975	304 Misty Dr	20742
93498	879.3941	384 Frosty Rd	20742
98491	179.3343	385 Oak St	20999

- (1 pt) Write your name in the space provided above.
- (3 pts) Write a relational algebra expression for phone numbers of accounts in postal code 20999.
- (3 pts) Write a SQL query that produces a table, with attributes named `account` and `averageWeight`, that lists the average package weight for each account that has

6. (3 pts) Rewrite the above query, but this time include all postal codes in the database, even those from which no packages have been shipped.

7. (4 pts) Write a relational algebra expression that is equivalent to the following SQL query. Write a brief English description of the query's output. You may assume that we have extended relational algebra to allow a *like* predicate (with the semantics of the SQL like predicate) in a selection operator. You may, but are not required to, use the mechanical method of translating queries.

```
select P.ID, P.Weight
from Packages P, Accounts A
where P.Acct = A.Acct and A.PostCode in
      (select PostCode from Accounts where Address like '%St');
```

8. (4 pts) Write a SQL query that is equivalent to the following relational algebra expression. As above, you may, but are not required to, use the mechanical method of translating queries.

$$\pi_{P.I} \sigma_{P.W < T.W} (P \times \rho_T P)$$