

**CS 386: Quiz 7, 30 May 2006**Name: \_\_\_\_\_ **KEY** \_\_\_\_\_

No books or notes. Work individually.

Consider two relations about restaurants and meals they serve:

```
restaurant( rname    cuisine    zip )
            Bangkok  Thai      97201
            Churra's Brazilian 97203
            Oskar's  German   97225
            ...
```

```
open( rname    meal )
     Bangkok  lunch
     Bangkok  dinner
     Churra's dinner
     ...
```

Consider the following relational algebra query over these two tables (where  $r$  = restaurant and  $o$  = open). Give **three** other algebra expressions that are equivalent to this query. (The expressions you give should be equivalent for any state of the database.)

$$\pi_{r.cuisine}(\sigma_{o.meal='lunch' \wedge r.zip=97233}(o \bowtie_{o.rname=r.rname} r))$$

*As you probably suspect, there are a lot more than three equivalent expressions. Here are just a few:*

$$\pi_{r.cuisine}(\sigma_{o.meal='lunch' \wedge r.zip=97233}(r \bowtie_{r.rname=o.rname} o))$$

$$\pi_{r.cuisine}(\sigma_{o.meal='lunch'}(\sigma_{r.zip=97233}(o \bowtie_{o.rname=r.rname} r)))$$

$$\pi_{r.cuisine}(\sigma_{r.zip=97233}(\sigma_{o.meal='lunch'}(o \bowtie_{o.rname=r.rname} r)))$$

$$\pi_{r.cuisine}(\sigma_{r.zip=97233}(\sigma_{o.meal='lunch'}(o) \bowtie_{o.rname=r.rname} r))$$

$$\pi_{r.cuisine}(\sigma_{o.meal='lunch'}(o) \bowtie_{o.rname=r.rname} \sigma_{r.zip=97233}(r))$$

*One expression that is not equivalent (in fact, it is not even properly formed) is the following. The problem is that the select condition needs to have meal and zip attributes, but the result of the project only has the cuisine attribute.*

$$\sigma_{o.meal='lunch' \wedge r.zip=97233}(\pi_{r.cuisine}(o \bowtie_{o.rname=r.rname} r))$$

Equivalences that might be useful:

$$\sigma_{C \wedge D}(s) \equiv \sigma_C(\sigma_D(s)) \equiv \sigma_D(\sigma_C(s))$$

$$\pi_X(\sigma_C(s)) \equiv \sigma_C(\pi_X(s)) \quad \text{if } C \text{ uses only attributes from } X$$

$$\sigma_C(s \bowtie t) \equiv s \bowtie \sigma_C(t) \quad \text{if } C \text{ uses only attributes from relation } t$$

$$(s \bowtie t) \equiv (t \bowtie s)$$