

CPSC471 - DATABASE MANAGEMENT SYSTEMS

University of Calgary
Assignment 3

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Question 1

A)

```
OTHER_SCHOOLS <- σcity != "Calgary"(SCHOOL)
RED_BOOKS <- σcolor="red"(BOOK)
RED_DISTRIBUTORS <- (DISTRIBUTE) * (RED_BOOKS) //natural join on ISBN
RED_DISTRIBUTORS_TO_OTHER <- (RED_DISTRIBUTORS)sname >< name(OTHER_SCHOOLS) //I use >< to indicate join
RED_PUBLISHERS <- PUBLISHERname >< pname(RED_DISTRIBUTORS_TO_OTHER)
RESULT <- πname,city(RED_PUBLISHERS)
```

B)

```
PARIS_SCHOOLS <- σcity="Paris"(SCHOOL)
LONDON_PUBLISHERS <- σcity="London"(PUBLISHER)
LONDON_PUB_DISTRIBUTORS <- (DISTRIBUTE)pname >< name(LONDON_PUBLISHERS)
PARIS_SCHOOLS_LONDON_PUBS <- (PARIS_SCHOOLS)name >< sname(LONDON_PUB_DISTRIBUTORS)
RESULT <- πdirector(PARIS_SCHOOLS_LONDON_PUBS)
```

C)

```
ROMA_PUBS <- σcity="Roma"(PUBLISHER)
TORONTO_SCHOOLS <- σcity="Toronto"(SCHOOL)
ROMA_DISTRIBUTORS_ <- (ROMA_PUBS)name >< pname(DISTRIBUTE)
ROMA_DISTRIBUTORS_TORONTO_SCHOOLS <- (ROMA_DISTRIBUTORS)sname >< name(TORONTO_SCHOOLS)
R1 <- (ROMA_DISTRIBUTORS_TORONTO_SCHOOLS) * (DISTRIBUTE) //natural join on pname
RESULT <- πsname(R1)
```

D)

```
CALGARY_SCHOOLS <- ρsname/name(πname(σcity="Calgary"(SCHOOL))
DISTRIBUTE1 <- πISBN,sname(DISTRIBUTE)
CALGARY_DISTRIBUTORS <- DISTRIBUTE1 ÷ CALGARY_SCHOOLS
OTHER_SCHOOLS <- ρsname/name(πname(σcity!="Calgary"(SCHOOL)
OTHER_DISTRIBUTORS <- CALGARY_DISTRIBUTORS * DISTRIBUTE //natural join on sname
RESULT1 <- CALGARY_DISTRIBUTORS - πISBN[(OTHERS_DISTRIBUTORS)sname >< name(OTHER_SCHOOLS)]
RESULT2 <- titleFtotal(quantity)(RESULT1*DISTRIBUTE*BOOK) //natural join * on ISBN
```

E)

```
PUBLISHERS <- ρpubname/name, pubphone/phone, pubcity/city(PUBLISHER)
DISTRIBUTE1 <- (PUBLISHERS)pubname >< pname(DISTRIBUTE)
DISTRIBUTE2 <- (DISTRIBUTE1)sname >< name(SCHOOL)
PUBS_SCHOOLS <- πpubname, sname[(PUBLISHERS)pubcity >< city(SCHOOL)]
PUB_SCHOOLS_SAME_CITY <- πpubname, sname[(σpubcity=city(DISTRIBUTE2)]
PUB_SCHOOLS_DIFF_CITY <- πpubname(PUBS_SCHOOLS - PUB_SCHOOLS_SAME_CITY)
PUB_SCHOOL_SAME_DIST <- PUBLISHERS - PUB_SCHOOLS_DIFF_CITY
DISTRIBUTE_SAME_CITY <- σpubcity=city(DISTRIBUTE2)
R1 <- DISTRIBUTE_SAME_CITY * PUB_SCHOOL_SAME_DIST
RESULT <- titleFtotal(quantity)(R1 * BOOK)
```

Question 2

A)

$\{s.stno \mid$
 $STREET(s) \wedge \forall c(CITY(c) \wedge c.country-name = \text{"Canada"}) \wedge$
 $\forall t((STREET(t) \wedge t.city-name=s.city-name \wedge t.stno \neq s.stno) \rightarrow s.length > t.length) \}$

B)

$\{h.owner-name \mid$
 $HOUSE(h) \wedge \forall c(CITY(c) \wedge c.country-name=\text{"Canada"}) \rightarrow$
 $\exists n (HOUSE(i) \wedge i.owner-name=h.owner-name) \wedge (\exists s(STREET(s) \wedge s.stno=i.stno \wedge s.city-name=c.city-name)) \}$

C)

$\{h.owner-name \mid$
 $HOUSE(h) \wedge (\exists i)(HOUSE(i) \wedge \exists s(STREET(s) \wedge s.stno=i.stno \wedge \exists c(CITY(c) \wedge c.city-name=s.cityname \wedge c.country-name \neq \text{"USA"})) \wedge$
 $\exists t(STREET(t) \wedge t.stno=h.stno \wedge \exists s(CITY(s) \wedge s.city-name=t.city-name \wedge s.country-name \neq \text{"USA"})) \wedge ..)\}$

D)

$\{c.name \mid$
 $COUNTRY(c) \wedge \exists b(BORDER(b) \wedge (b.country-name1 = \text{"Germany"} \wedge b.country-name2 = c.name) \parallel$
 $(b.country-name1=c.name \wedge b.country-name2 = \text{"Germany"})) \}$

E)

$\{h.owner-name \mid$
 $HOUSE(h) \wedge \forall c((COUNTRY(c) \wedge \exists b(BORDER(b) \wedge (b.country-name1=\text{"Spain"} \wedge b.country-name2=c.name$
 $\parallel b.country-name1=c.name \wedge b.country-name2=\text{"Spain"}))) \rightarrow$
 $\exists i(HOUSE(i) \wedge \exists s(STREET(s) \wedge s.stno=i.stno \wedge \exists d(CITY(d) \wedge d.city-name=s.city-name \wedge d.country-name=c.name \wedge i.owner-$
 $name=h.owner-name))))\}$

