

# Quiz 1 Answers, Spring 2018

## CSCI 4380 Database Systems

**Question (Points: a-5 b-10 c-10).** You are given the following data model containing TV shows featuring heroes (note that this is slightly different than the one we used in class examples. I renamed all attributes for simplicity):

```
TVShow(showname1, startyear1, tv_channel1, endyear1)
ShowMainHeroes(showname2, startyear2, heroname2)
Episode(eid3, seasonid3, episodeid3, showname3, startyear3, title3, airyear3)
GuestHero(eid4, heroname4)
```

Shows have main heroes (ShowMainHeroes). On top, each episode is for a specific show, given by its key: **showname**, **startyear**. Episodes may feature one or more guest heros. We removed other relations for simplicity, so use only these relations in your queries.

Answer the following questions:

- (a) For the following, circle one of yes/no based on the relations above and its keys:

Can there be two different shows with the same name in the same starting year?	NO
In a given starting year, can there be two different shows on the same TV Channel?	YES
Can the same guest hero be in two different episodes of the same show?	YES
Can there be two episodes with the same season id and same episode id?	YES
Can the same hero be on two different shows in the same starting year?	YES

- (b) Return the show name, starting year for all TV shows that had no guest hero appearances.

**Answer.**

$$\begin{aligned}
 R(\text{showname1}, \text{startyear1}) &= \Pi_{\text{showname3}, \text{startyear3}}(\text{Episode} \bowtie_{\text{eid3}=\text{eid4}} \text{GuestHero}) \\
 \text{Result} &= (\Pi_{\text{showname1}, \text{startyear1}} \text{TVShow}) - R
 \end{aligned}$$

- (c) Return the show name, starting year for all TV shows (a) where one of the main heroes was also a guest hero in another TV show (b) while show (a) was on the air (i.e. shows (a) and (b) both had an episode in the same year and the episode for (b) featured a hero from show (a)).

**Answer.**

$$\begin{aligned}
 R1 &= \text{GuestHero} \bowtie_{\text{heroname2}=\text{heroname4}} \text{ShowMainHeroes} \\
 R2 &= R1 \bowtie_{\text{showname1}=\text{showname2} \text{ and } \text{startyear1}=\text{startyear2}} \text{TVShow} \\
 R3 &= R2 \bowtie_{\text{showname3}=\text{showname2} \text{ and } \text{startyear3}=\text{startyear2}} \text{Episode} \\
 E5(\text{eid5}, s5, st5, \text{airyear5}) &= \Pi_{\text{eid3}, \text{showname3}, \text{startyear3}, \text{airyear3}} \text{Episode} \\
 \text{Result} &= \Pi_{\text{heroname2}}(R3 \bowtie_C E5)
 \end{aligned}$$

where  $C : \text{eid4} = \text{eid5} \text{ and } \text{airyear3} = \text{airyear5} (s5 <> \text{showname1} \text{ or } \text{startyear1} <> st5)$

R1: same hero

R3: Find TV show episode for the main hero

Result: Check that the episode for the guest hero is in the same year as an episode for the main hero, but for a different show

Note that I broke things down for readability and Latex purposes, but it also helps checking the logic!

If you assume that hero can never be guest hero for their own show (a reasonable assumption), and if you write this assumption down, then you can skip the condition:  $s5 \neq showname1 \vee startyear1 \neq st5$ .