

CRN	No	Full Name	Signature
12303 (TU)			
12305 (ŞÖ)			

1	2	3	4	5	Total
/35	/15	/20	/15	/15	/100

No questions are allowed. Answer the questions to the best of your understanding. If you need to make extra assumptions, state them clearly. Make sure that all your answers are sufficiently explained.

1. Consider the *performance* database with the following two relations:

**performers** (name, genre)

**Grammy\_Nominations** (name, category, year, isWinner)

**performers**

name	genre
Coldplay	Rock
Amy Winehouse	R&B
Arizona Shakes	Rock
Frank Ocean	R&B
The Black Keys	Rock

**Grammy\_Nominations**

- a. Write an SQL statement to list the names and genres of 2013 Grammy winners.

name	category	year	isWinner
Arizona Shakes	New Artist	2013	no
Arizona Shakes	Rock Performance	2013	no
Frank Ocean	Album of the Year	2013	no
Frank Ocean	Rap/Sung Collaboration	2013	yes
Coldplay	Rock Performance	2013	no
Coldplay	Rock Album	2009	yes
Coldplay	Album of the Year	2009	no
Coldplay	Rock Performance	2012	no
The Black Keys	Rock Performance	2013	yes

and

- b. Write an SQL statement to list the years in which Coldplay was nominated for a Grammy but did not win.

- c. Write an SQL statement to list the names and nomination years for all performers that were nominated for at least 2 Grammys in a given year.
- d. Write an SQL statement to list the names of performers that were nominated for the same category in the same year.

2. Answer the true/false questions below, providing a brief explanation of your answers. You will not receive marks for answers without explanation.

- a. Relations that are in 3NF must also be in BCNF. ( ) *TRUE* ( ) *FALSE*
  
- b. The projection operation selects certain rows (tuples) of a relation. ( ) *TRUE* ( ) *FALSE*
  
- c. In SQL, an attribute declared as UNIQUE can have NULL as its value. ( ) *TRUE* ( ) *FALSE*
  
- d. In SQL, every table must have at least one candidate key. ( ) *TRUE* ( ) *FALSE*
  
- e. A foreign key in a table R, which refers to an attribute of another table S, must not be null in R.  
( ) *TRUE* ( ) *FALSE*

3. For the following questions select your answer, providing a brief explanation of your answers. You will not receive marks for answers without explanation.
- a. Consider a relation  $R(A,B,C,D,E)$  with functional dependencies:  $AB \rightarrow C$ ,  $C \rightarrow D$ ,  $BD \rightarrow E$ . Which of the following sets of attributes does not functionally determine E?  
☐ BC                      ☐ ACD                      ☐ AB                      ☐ BE
- b. Consider a relation R with five attributes ABCDE. You are given the following dependencies:  $A \rightarrow B$ ,  $BC \rightarrow E$ , and  $ED \rightarrow A$ . State the strongest normal form that the relation is in.  
☐ 1NF                      ☐ 2NF                      ☐ 3NF                      ☐ BCNF
- c. Consider a relation  $R(A,B,C,D,E)$  with functional dependencies:  $D \rightarrow C$ ,  $CE \rightarrow A$ ,  $D \rightarrow A$ ,  $AE \rightarrow D$ . Which of the following is a key?  
☐ BCE                      ☐ AD                      ☐ A                      ☐ CDE
- d. Let relation  $R(A,B,C,D,E)$  satisfy the following functional dependencies:  $AB \rightarrow C$ ,  $BC \rightarrow D$ ,  $CD \rightarrow E$ ,  $DE \rightarrow A$ ,  $AE \rightarrow B$ . Which of the following FDs is also guaranteed to be satisfied by R?  
☐  $BC \rightarrow A$                       ☐  $AD \rightarrow B$                       ☐  $AC \rightarrow B$                       ☐  $A \rightarrow C$
4. When developing database applications, what is the problem with using input values from end users? How can this problem be solved?
5. What is a surrogate key? What are the advantages and disadvantages of using surrogate keys?

*USE THIS PAGE ONLY FOR TAKING NOTES. ANYTHING ON THIS PAGE WILL NOT BE GRADED.*