



Week 2 Workshop

Assignment Project Exam Help

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Housekeeping

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1 Please attend the lab that you had registered for and the lab signup had been finalised. Lab swaps are not allowed unless there is a special consideration and an approval.

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Th

3 Af
en

(Aug 6, Fri 3-5 pm) in Week 2.

4 An optional exercise website is available for our co

<https://cs.anu.edu.au/dab/bench/db->

5 Make effective use of Wattle discussion forum.

- We strongly encourage you to ask your questions on the forum, and everyone in the class can benefit from the discussions and answers.
- You should not post any solutions/results/ideas/interpretations related to assessment items (including assignments, quizzes, tests, exams).

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Thanks for your feedback!

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Assignment Project Exam Help

(1) Set, Tuple, Cartesian product of sets and Relation

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<https://en.wikipedia.org/wiki/> <https://en.wikipedia.org/wiki/>

Anna_Kiesenhofer

Terence_Tao



Set – Example

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- A set is a **collection** of **distinct** elements.

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Set – Example

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- A set is a **collection** of **distinct** elements.

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Set – Example

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- A set is a **collection** of **distinct** elements.

• c <https://eduassistpro.github.io>

- **Distinct**: each element can not be in the set more than once.

e.g. $\{A, A, B\}$ is NOT a set.

Note that **multisets** allow to have duplicate elements.

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Set – Example

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- A set is a **collection** of **distinct** elements.

• ^ce. <https://eduassistpro.github.io>
- **Distinct**: each element can not be in the set more than once.
e.g. $\{A, A, B\}$ is NOT a set.
Note that **multisets** allow to have duplicate elements.
- **Cardinality**: the cardinality of a set is the number of elements of the set.

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Tuple – Example

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- At

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Tuple – Example

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- At
- <https://eduassistpro.github.io>
- or
e.g., $(A, B) \neq (B, A)$

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Tuple – Example

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- A tuple
 - <https://eduassistpro.github.io/>
 - or e.g., $(A, B) \neq (B, A)$
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- The same element can be in a tuple more
 - e.g., (A, A, B) is a tuple.



A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.

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A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.
- $s : t$ <https://eduassistpro.github.io>

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A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.
- $s^t : t$ <https://eduassistpro.github.io>
- **Tuple:**
 - the elements in a tuple have an order

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A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.
- $s^t : \text{https://eduassistpro.github.io}$
- **Tuple:**
 - the elements in a tuple have an order
- Question 1: $\{(A,B), (A,C)\} = \{(A,C), (A,B)\}$

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A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.
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A Set of Tuples – Example

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- Question 1: $\{(A,B), (A,C)\} = \{(A,C), (A,B)\}$

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A Set of Tuples – Example

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- A set of tuples is a collection of distinct tuples.

- s^t

$\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- **Tuple:**

- the elements in a tuple have an order

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- Question 1: $\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- Question 2: $\{ (A,B), (A,C) \} = \{ (B,A), (A,C) \} ?$



A Set of Tuples – Example

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- A set of tuples is a collection of distinct tuples.

- s^t

$\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- **Tuple:**

- the elements in a tuple have an order

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- Question 1: $\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- Question 2: $\{ (A,B), (A,C) \} = \{ (B,A), (A,C) \} ?$



A Set of Tuples – Example

Assignment Project Exam Help

- A set of tuples is a collection of distinct tuples.

- s^t

$\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- **Tuple:**

- the elements in a tuple have an order

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- Question 1: $\{ (A,B), (A,C) \} = \{ (A,C), (A,B) \}$

- Question 2: $\{ (A,B), (A,C) \} = \{ (B,A), (A,C) \}$? No!



Cartesian product – Examples

- Let $Class$ and $Room$ be two sets:

- $Class = \{comp2400, comp6140, comp1100\}$
- $Room = \{RT1, CT1\}$

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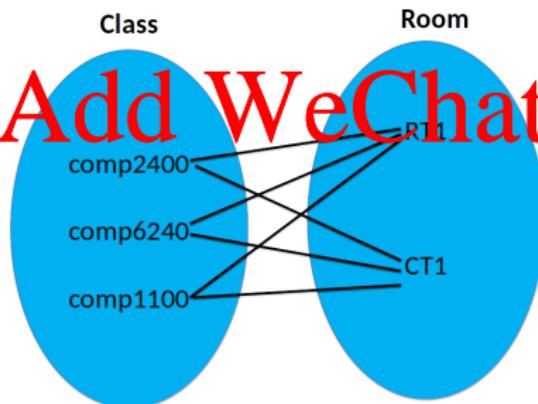
Cartesian product – Examples

- Let $Class$ and $Room$ be two sets:

- $Class = \{comp2400, comp6240, comp1100\}$
- $Room = \{RT1, CT1\}$

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- $= (c$

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m	n
1	1
comp6240	RT1
comp6240	CT1
comp1100	RT1
comp1100	CT1

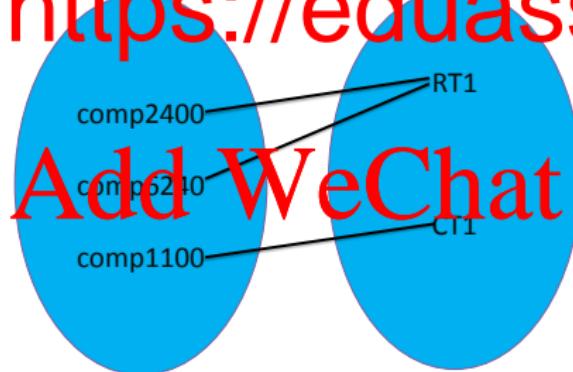


Relations – Examples

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- $R_1 = \{(comp2400, RT1), (comp6240, RT1), (comp1100, CT1)\}$

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m
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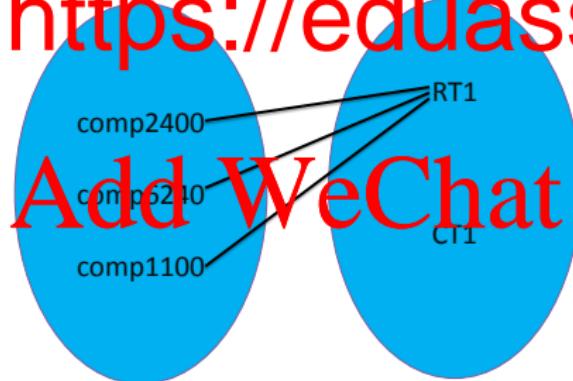


Relations – Examples

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- $R_2 = \{(comp2400, RT1), (comp6240, RT1), (comp1100, RT1)\}$

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1
1

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Relations – Examples

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- Let $Class$ and $Room$ be two sets:
 - $Class = \{comp2400, comp6240, comp1100\}$
 -
- $Class = \{(c_1, R_1), (c_2, R_2), (c_3, R_3)\}$
- $R_1 = \{(comp2400, RT1), (comp6240, RT2)\}$
- $R_2 = \{(comp2400, RT1), (comp6240, RT2)\}$
- **What is the relationship of R_1 and R_2 with $Class \times Room$?**

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Relations – Examples

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- Let $Class$ and $Room$ be two sets:
 - $Class = \{comp2400, comp6240, comp1100\}$
 -
- $Class = \{(c_1, r_1), (c_2, r_2), (c_3, r_3)\}$
- $R_1 = \{(comp2400, RT1), (comp6240, RT2)\}$
- $R_2 = \{(comp2400, RT1), (comp6240, RT2)\}$
- **What is the relationship of R_1 and R_2 with $Class \times Room$?**

Answer: R_1 , R_2 are the subsets of $Class \times Room$.

R_1 , R_2 and $Class \times Room$ are all sets of tuples.



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(2) Relation Table, Relation Schema, Relation Database Schema and Relation Database State

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Relation v.s. Table (Example)

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016

- C

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Table	Relation
Column	
Data type	
Row	
Table definition	

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Relation v.s. Table (Example)

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016

- C

<https://eduassistpro.github.io>

Table	Relation
Column	
Data type	
Row	
Table definition	

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- How many tuples and attributes does the table ENROL have?



Relation v.s. Table (Example)

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016

- C

<https://eduassistpro.github.io>

Table	Relation
Column	
Data type	
Row	
Table definition	

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- How many tuples and attributes does the table ENROL have?

3 tuples and 5 attributes.



Relation v.s. Table (Example)

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016

- C

<https://eduassistpro.github.io>

Table	Relation
Column	
Data type	
Row	
Table definition	

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- How many tuples and attributes does the table ENROL have?
3 tuples and 5 attributes.
- In the relational data model, the order of tuples in a relation is important but the order of the attributes in a relation is not important?



Relation v.s. Table (Example)

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016

- C

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Table	Relation
Column	
Data type	
Row	
Table definition	

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- How many tuples and attributes does the table ENROL have?
3 tuples and 5 attributes.
- In the relational data model, the order of tuples in a relation is important but the order of the attributes in a relation is not important?
No.



Relation Schema – Example

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ENROL		
StudentID	CourseNo	Semester
1234567890	CS101	SEM1



Relational Database Schema – Example

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- A relational database schema S is

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StudentID	Name		
-----------	------	--	--

No	COURSE	
	CNo	Cname

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ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate



Relational Database State – Example

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- A relational database state of S is a set of relations such that
 - there is just one relation for each relation schema in S , and
 - all the relations satisfy the integrity constraints IC .

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StudentID	StudentName	DateOfBirth	EmailAddress
459	Fran	11/09/1987	frankk@gmail.com

COURSE	
COMP1130	Introduction to Advanced Computer Systems
COMP2400	Relational Datab...

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
458	COMP1130	2016 S1	active	20/02/2016
459	COMP2400	2016 S2	active	11/06/2016



Relational Database State – Example

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- A **relational database state** of S is a set of relations such that

- there is just one relation for each relation schema in S

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Relation

STUD			
StudentID	Name	D	
456	John	25/0	
458	Peter	23/0	
459	Fran	11/09/1987	frankk@gmail.com

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Relational Database State – Example

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- A **relational database state** of S is a set of relations such that

- there is just one relation for each relation schema in S

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Relation

STUD			
StudentID	Name	D	
456	Tom	25/0	
458	Peter	23/0	
459	Fran	11/09/1987	frankk@gmail.com

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- Can there be multiple relations that correspond to the same relation schema in a relational database state?



Relational Database State – Example

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- A **relational database state** of S is a set of relations such that

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<https://eduassistpro.github.io>

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STUD			
StudentID	Name	D	
456	John	25/0	
458	Peter	23/0	
459	Fran	11/09/1987	frankk@gmail.com

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- Can there be multiple relations that correspond to the same relation schema in a relational database state?

No.



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(2) Superkey, Candidate key, Primary key and Foreign key

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(Ashmolean Museum @ the University of Oxford www.ashmolean.org/)



A Bunch of Keys

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A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

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A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$
- A superkey K is called a **candidate key** if no proper subset of K is a su

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A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

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- A superkey K is called a **candidate key** if no proper subset of K is a superkey.

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A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

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- A superkey K is called a **candidate key** if no proper subset of K is a superkey
- The <https://eduassistpro.github.io>

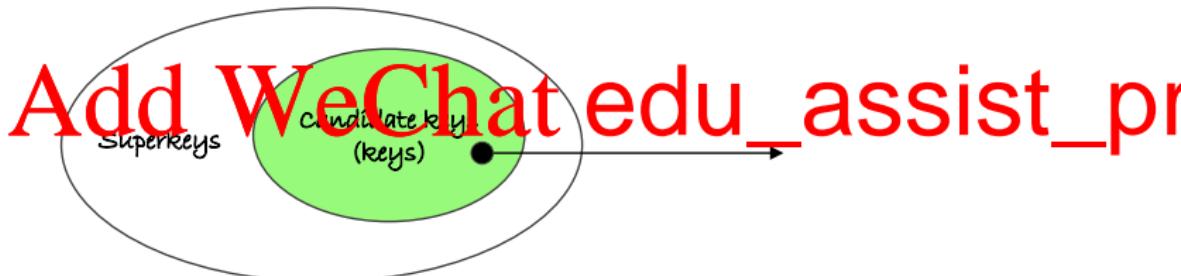
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A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

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- The <https://eduassistpro.github.io>

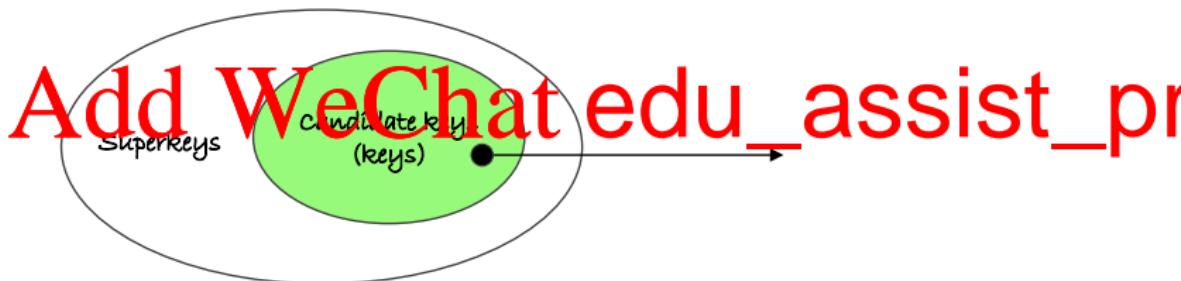




A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

- A superkey K is called a **candidate key** if no proper subset of K is a superkey.
- Then <https://eduassistpro.github.io>



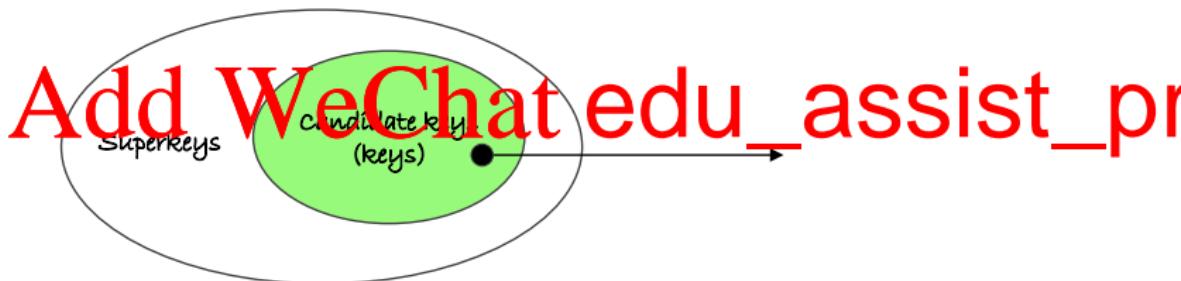
- Every candidate key must be a superkey in the same relation schema?



A Bunch of Keys

- A subset of the attributes of a relation schema R is a **superkey** if it uniquely identifies any tuple in $I(R)$

- A superkey K is called a **candidate key** if no proper subset of K is a superkey.
- Then <https://eduassistpro.github.io>



- Every candidate key must be a superkey in the same relation schema?
Yes.



Superkey – Example

- No two courses have the same No $\Rightarrow \{No\}$ is a superkey (SK) of COURSE

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COURSE		
No	Cname	Unit

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Superkey – Example

- No two courses have the same No $\Rightarrow \{No\}$ is a superkey (SK) of COURSE

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COURSE		
No	Cname	Unit

<https://eduassistpro.github.io>

- No two students have the same StudentID StudentID is a SK of STUDENT.
- No two students have the same Email \Rightarrow

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STUDENT			
StudentID	Name	DoB	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com
459	Fran	11/09/1987	frankk@gmail.com
...



Superkey, Candidate key and Primary key – Example

- {StudentID} is a **SK** of STUDENT and {Email} is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

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Superkey, Candidate key and Primary key – Example

- {StudentID} is a **SK** of STUDENT and {Email} is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

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Superkey, Candidate key and Primary key – Example

- $\{ \text{StudentID} \}$ is a **SK** of STUDENT and $\{ \text{Email} \}$ is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

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For STUDENT, a SK can be any subset of attributes

StudentID or any subset of attributes which includ

$\{ \text{StudentID}, \{ \text{StudentID}, \text{Name} \} \}$ $\{ \text{Stude$

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Superkey, Candidate key and Primary key – Example

- $\{ \text{StudentID} \}$ is a SK of STUDENT and $\{ \text{Email} \}$ is also a SK of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

<https://eduassistpro.github.io>

- W

For STUDENT, a SK can be any subset of attributes

StudentID or any subset of attributes which includ

$\{ \text{StudentID}, \{ \text{StudentID}, \text{Name} \}, \{ \text{Stude} \}$

- What are **candidate keys** of STUDENT?

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Superkey, Candidate key and Primary key – Example

- $\{ \text{StudentID} \}$ is a **SK** of STUDENT and $\{ \text{Email} \}$ is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

<https://eduassistpro.github.io>

- W

For STUDENT, a SK can be any subset of attributes
StudentID or any subset of attributes which includ
 $\{ \text{StudentID} \}$, $\{ \text{StudentID}, \text{Name} \}$, $\{ \text{Stude$

- What are **candidate keys** of STUDENT?

For STUDENT, $\{ \text{StudentID} \}$ and $\{ \text{Email} \}$ are two candidate keys.

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Superkey, Candidate key and Primary key – Example

- $\{ \text{StudentID} \}$ is a **SK** of STUDENT and $\{ \text{Email} \}$ is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

<https://eduassistpro.github.io>

- W

For STUDENT, a SK can be any subset of attributes
StudentID or any subset of attributes which includ
 $\{ \text{StudentID} \}$, $\{ \text{StudentID}, \text{Name} \}$, $\{ \text{Stude$

- What are **candidate keys** of STUDENT?

For STUDENT, $\{ \text{StudentID} \}$ and $\{ \text{Email} \}$ are two candidate keys.

- What about the **primary key** of STUDENT?

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Superkey, Candidate key and Primary key – Example

- $\{ \text{StudentID} \}$ is a **SK** of STUDENT and $\{ \text{Email} \}$ is also a **SK** of STUDENT.

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STUDENT			
StudentID	Name	DoB	Email

<https://eduassistpro.github.io>

- W

For STUDENT, a SK can be any subset of attributes
StudentID or any subset of attributes which include
 $\{ \text{StudentID} \}$, $\{ \text{StudentID}, \text{Name} \}$, $\{ \text{StudentID}, \text{Email} \}$

- What are **candidate keys** of STUDENT?

For STUDENT, $\{ \text{StudentID} \}$ and $\{ \text{Email} \}$ are two candidate keys.

- What about the **primary key** of STUDENT?

For STUDENT, the primary key can be chosen as either $\{ \text{StudentID} \}$ or $\{ \text{Email} \}$.



Superkey – Example

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NROL.

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456	COMP2400	2016		
458	COMP1130	2016		
459	COMP2400	2016		
...		

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Superkey, Candidate key and Primary key – Example

- $\{StudentID, CourseNo, Semester\}$ is a SK of ENROL.

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ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

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Superkey, Candidate key and Primary key – Example

- $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$ is a SK of ENROL.

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ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

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- What are all **SKs** of ENROL?

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Superkey, Candidate key and Primary key – Example

- $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$ is a SK of ENROL.

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

<https://eduassistpro.github.io>

- What are all **SKs** of ENROL?

For ENROL, a SK can be any subset of attributes which uniquely identify a row. For example, {StudentID, CourseNo} and {Semester} e.g., $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$, $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$

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Superkey, Candidate key and Primary key – Example

- $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$ is a SK of ENROL.

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

<https://eduassistpro.github.io>

- What are all **SKs** of ENROL?

For ENROL, a SK can be any subset of attributes which uniquely identify a row. For example, {StudentID, CourseNo} and {Semester} e.g., $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$, $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$

- What are **candidate keys** of ENROL?

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Superkey, Candidate key and Primary key – Example

- $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$ is a SK of ENROL.

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

<https://eduassistpro.github.io>

- What are all **SKs** of ENROL?

For ENROL, a SK can be any subset of attributes which uniquely identify a row. For example, {StudentID, CourseNo} and {Semester} e.g., $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$, $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$

- What are **candidate keys** of ENROL?

For ENROL, $\{\text{StudentID}, \text{CourseNo}, \text{Semester}\}$ is the only candidate key.

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Superkey, Candidate key and Primary key – Example

- $\{StudentID, CourseNo, Semester\}$ is a SK of ENROL.

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

<https://eduassistpro.github.io>

- What are all **SKs** of ENROL?

For ENROL, a SK can be any subset of attributes which include StudentID, CourseNo and Semester, e.g., {StudentID, Semester}, {StudentID, CourseNo, Semester}

- What are **candidate keys** of ENROL?

For ENROL, $\{StudentID, CourseNo, Semester\}$ is the only candidate key.

- What about the **primary key** of ENROL?



Superkey, Candidate key and Primary key – Example

- $\{StudentID, CourseNo, Semester\}$ is a SK of ENROL.

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
				16
				16

<https://eduassistpro.github.io>

- What are all **SKs** of ENROL?

For ENROL, a SK can be any subset of attributes which include StudentID, CourseNo and Semester, e.g., {StudentID, Semester}, {StudentID, CourseNo, Semester}

- What are **candidate keys** of ENROL?

For ENROL, $\{StudentID, CourseNo, Semester\}$ is the only candidate key.

- What about the **primary key** of ENROL?

For ENROL, the primary key can only be $\{StudentID, CourseNo, Semester\}$.



Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

• HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

- BOOKING

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

• HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

• BOOKING

- Some additional constraints are as follows:

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

- HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

- BOOKING

- Some additional constraints are as follows:

- ① A booking can be made for one day only.

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

- HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

- BOOKING

- Some additional constraints are as follows:

- 1 A booking can be made for one day only
- 2 A guest can make several bookings in a hotel if

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

- HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

- BOOKING

- Some additional constraints are as follows:

- 1 A booking can be made for one day only.
- 2 A guest can make several bookings in a hotel if
- 3 A guest cannot make two or more bookings in the same day.

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

- HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,

<https://eduassistpro.github.io>

- BOOKING

- Some additional constraints are as follows:

- 1 A booking can be made for one day only.
- 2 A guest can make several bookings in a hotel.
- 3 A guest cannot make two or more bookings in the same day.
- 4 A guest can make two or more bookings in different hotels for the same day.

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Superkey, Candidate key and Primary key – Exercise

- Find out candidate keys of BOOKING from the following schema of an ACCOMMODATION database held in a relational DBMS:

- HOTEL(hotelNo, hotelName, city) with the primary key {hotelNo},
roomNo,
-

<https://eduassistpro.github.io>

- BOOKING

- Some additional constraints are as follows:

- ① A booking can be made for one day only.
- ② A guest can make several bookings in a hotel.
- ③ A guest cannot make two or more bookings in the same day.
- ④ A guest can make two or more bookings in different hotels for the same day.
- ⑤ A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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be held in the name of one guest.

- Is {guestNo, hotelNo, date} a minimal SK and

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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be held in the name of one guest.

- Is {guestNo, hotelNo, date} a minimal SK and

• Is {guestNo, hotelNo, date} a PK?

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

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Superkey, Candidate key and Primary key – Exercise

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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be held in the name of one guest.

- Is {guestNo, hotelNo, date} a minimal SK and
 - Is {guestNo, hotelNo, date} a SK?
 - Is {guestNo, hotelNo} a SK? No bec
 - Is {guestNo, date} a SK? No because of (4).

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

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- Is {guestNo, hotelNo, date} a minimal SK and
 - Is {guestNo, hotelNo, date} a SK?
 - Is {guestNo, hotelNo} a SK? No bec
 - Is {guestNo, date} a SK? No because of (4).
 - Is {hotelNo, date} a SK?

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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be held in the name of one guest.

- Is {guestNo, hotelNo, date} a minimal SK and a candidate key?
 - Is {guestNo, hotelNo, date} a SK?
 - Is {guestNo, hotelNo} a SK? No because a guest can have multiple bookings.
 - Is {guestNo, date} a SK? No because of (4).
 - Is {hotelNo, date} a SK? No because a hotel usually has multiple rooms (indicated by the fact that ROOM(roomNo, hotelNo, type, price) has the primary key {roomNo, hotelNo}).

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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<https://eduassistpro.github.io>

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be held in the name of one guest.

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?
 - Is {guestNo, hotelNo, date} a SK?
 - Is {guestNo, hotelNo} a SK? No because it does not uniquely identify a booking.
 - Is {guestNo, date} a SK? No because of (4).
 - Is {hotelNo, date} a SK? No because a hotel usually has multiple rooms (indicated by the fact that ROOM(roomNo, hotelNo, type, price) has the primary key {roomNo, hotelNo}).
- Thus {guestNo, hotelNo, date} a minimal SK and hence a candidate key.



Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.
 - 3
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 - 5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.
- Is {guestNo, Hotel No., room No.} a candidate key?

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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- 5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.
- Is {guestNo, Hotel No., room No.} a candidate key? If not, why not? Hint: No, it is not even a SK because of (2).

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Superkey, Candidate key and Primary key – Exercise

- BOOKING(guestNo, hotelNo, date, roomNo).

A booking can be made for one day only.

- 2 A guest can make several bookings in a hotel for different days.



<https://eduassistpro.github.io>

- 5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.

- Is {guestNo, NoteNo, roomNo} a candidate key?

No, it is not even a SK because of (2).

- Is {guestNo, date, roomNo} a candidate key?



Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.

•

<https://eduassistpro.github.io>

- - 5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.
- Is {guestNo, hotelNo, roomNo} a candidate key?
No, it is not even a SK because of (2).
- Is {guestNo, date, roomNo} a candidate key?
No, it is not even a SK because of (4).

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.



- 5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.

- Is {guestNo, hotelNo, roomNo} a candidate key? No, it is not even a SK because of (2).
- Is {guestNo, date, roomNo} a candidate key? No, it is not even a SK because of (4).
- Is {hotelNo, date, roomNo} a candidate key?

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

3

4

<https://eduassistpro.github.io>

5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.

- Is {guestNo, hotelNo, roomNo} a candidate key?

No, it is not even a SK because of (2).

- Is {guestNo, date, roomNo} a candidate key?

No, it is not even a SK because of (4).

- Is {hotelNo, date, roomNo} a candidate key?

Yes, it is a SK because of (3) and (5) and no proper subset of {hotelNo, date, roomNo} is a SK, hence {hotelNo, date, roomNo} is a candidate key.



Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.

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<https://eduassistpro.github.io>

5 A booking cannot be in joint names. In other words a booking can only be held in the name of one guest.

- Is {guestNo, hotelNo, roomNo} a candidate key?

No, it is not even a SK because of (2).

- Is {guestNo, date, roomNo} a candidate key?

No, it is not even a SK because of (4).

- Is {hotelNo, date, roomNo} a candidate key?

Yes, it is a SK because of (3) and (5) and no proper subset of {hotelNo, date, roomNo} is a SK, hence {hotelNo, date, roomNo} is a candidate key.



Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.



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- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.



<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
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<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.

<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK?

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.



<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.

• Is {guestNo, hotelNo, date} is a SK?

• Is {guestNo, hotelNo} a SK? Nope.

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.



<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.

• Is {guestNo, hotelNo, date} is a SK?

• Is {guestNo, hotelNo} a SK? Nope

• Is {guestNo, date} a SK?

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.
 - 3
- <https://eduassistpro.github.io>
- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK? Nope
 - Is {guestNo, date} a SK? Yes beca

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
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 - 3
- <https://eduassistpro.github.io>
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 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK? Nope
 - Is {guestNo, date} a SK? Yes beca

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).

1 A booking can be made for one day only.

2 A guest can make several bookings in a hotel for different days.



<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK? No because
 - Is {guestNo, date} a SK? Yes because
- Thus {guestNo, hotelNo, date} is no longer a **minimal** candidate key.

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.

<https://eduassistpro.github.io>

- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?.
 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK? No because
 - Is {guestNo, date} a SK? Yes because
- Thus {guestNo, hotelNo, date} is no longer a **minimal** candidate key.
- Now {guestNo, date} is a minimal SK and hence a candidate key.

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Superkey, Candidate key and Primary key – Exercise

Assignment Project Exam Help

- BOOKING(guestNo, hotelNo, date, roomNo).
 - 1 A booking can be made for one day only.
 - 2 A guest can make several bookings in a hotel for different days.

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- Is {guestNo, hotelNo, date} a minimal SK and hence a candidate key?
 - Is {guestNo, hotelNo, date} is a SK?
 - Is {guestNo, hotelNo} a SK? No because
 - Is {guestNo, date} a SK? Yes because
- Thus {guestNo, hotelNo, date} is no longer a **minimal** candidate key.
- Now {guestNo, date} is a minimal SK and hence a candidate key.
- Note that {hotelNo, date, roomNo} is also a minimal SK and hence a candidate key.

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

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- Is it A <https://eduassistpro.github.io>

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

- Is it

A

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- Is it possible that $\{B, C\}$ is a SK?

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

- Is it

A

<https://eduassistpro.github.io/>

- Is it possible that $\{B, C\}$ is a SK?

Answer: $\{B, C\}$ must be a SK because {

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

- Is it

A

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- Is it possible that $\{B, C\}$ is a SK?

Answer: $\{B, C\}$ must be a SK because {

- If it possible that $\{B, D\}$ is a SK? (tricky)

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Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

- Is it

A

<https://eduassistpro.github.io/>

- Is it possible that $\{B, C\}$ is a SK?

Answer: $\{B, C\}$ must be a SK because {

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- If it possible that $\{B, D\}$ is a SK? (tricky)

Answer: $\{B, D\}$ cannot be a SK because $\{B, D\}$ does not have any candidate key as its subset.



Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema $R(A, B, C, D)$ has only two candidate keys $\{A, B\}$ and $\{C\}$.

Assignment Project Exam Help

- Is it

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- Is it possible that $\{B, C\}$ is a SK?

Answer: $\{B, C\}$ must be a SK because {

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- If it possible that $\{B, D\}$ is a SK? (tricky)

Answer: $\{B, D\}$ cannot be a SK because $\{B, D\}$ does not have any candidate key as its subset.



Superkey, Candidate key and Primary key – Exercise

- Assume that a relation schema R(A, B, C, D) has only two candidate keys $\{A, B\}$ and $\{C\}$.

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- If it possible that $\{B, D\}$ is a SK? (tricky)

Answer: $\{B, D\}$ cannot be a SK because $\{B, D\}$ does not have any candidate key as its subset.



Assignment Project Exam Help

(4) Domain constraints, Key constraints, Entity integrity constraints
and Ref

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Domain constraints, Key constraints and Entity integrity

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Domain constraints, Key constraints and Entity integrity

Assignment Project Exam Help

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- **Key constraints:** a bunch of keys (superkey, candidate key).

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Domain constraints, Key constraints and Entity integrity

Assignment Project Exam Help

- D constraints at main of its

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- Key constraints: a bunch of keys (superkey, candidate key).

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- Entity integrity constraints: no primary key value can be NULL.



Domain constraints, Key constraints and Entity integrity

Assignment Project Exam Help

- D constraints at main of its

e. <https://eduassistpro.github.io>

- Key constraints: a bunch of keys (superkey, candidate key).

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- Entity integrity constraints: no primary key value can be NULL.



Referential integrity constraints – Example

Assignment Project Exam Help

- Identify foreign keys, if any, in HOTEL, ROOM, BOOKING and GUEST relations.

•
•

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roomNo,

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- $\{ \quad \}$
- BOOKING(guestNo, hotelNo, date, roo

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Referential integrity constraints – Example

Assignment Project Exam Help

- Identify foreign keys, if any, in HOTEL, ROOM, BOOKING and GUEST relations.

•
•

elNo},
roomNo,

<https://eduassistpro.github.io>

- $\{ \quad \}$
- BOOKING(guestNo, hotelNo, date, roomNo)

- Answer
 - Room: $[hotelNo] \subseteq HOTEL[hotelNo]$



Referential integrity constraints – Example

Assignment Project Exam Help

- Identify foreign keys, if any, in HOTEL, ROOM, BOOKING and GUEST relations.

•
•
•

elNo},
roomNo,

<https://eduassistpro.github.io>

{ }

- BOOKING(guestNo, hotelNo, date, roomNo)

- Answer Add WeChat edu_assist_pro

- Room: $[\text{hotelNo}] \subseteq \text{HOTEL}[\text{hotelNo}]$
- BOOKING: $[\text{hotelNo}] \subseteq \text{HOTEL}[\text{hotelNo}]$,
 $[\text{guestNo}] \subseteq \text{GUEST}[\text{guestNo}]$,
 $[\text{roomNo}, \text{hotelNo}] \subseteq \text{Room}[\text{roomNo}, \text{hotelNo}]$.



Referential integrity constraints – Example

Assignment Project Exam Help

- Identify foreign keys, if any, in HOTEL, ROOM, BOOKING and GUEST relations.

• :

• :

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{ }

- BOOKING(guestNo, hotelNo, date, roomNo)
- Answer

• Room: $[hotelNo] \subseteq HOTEL[hotelNo]$

• BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$,
 $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq Room[roomNo, hotelNo]$.



Foreign Key (referential integrity) – Example

- Room: [hotelNo] \subset HOTEL[hotelNo];

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$, $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$, $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$, $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$ $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it
possible
to add
a new
GUEST.

- Is it possible to add a new room in the ROOM relation?

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$ $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it
possible
to add
a new
room
i.e.
GUEST.

- Is it possible to add a new room in the ROOM relation listed in the HOTEL relation?

Answer: Impossible because in ROOM: [

the hotelNo value of ROOM must exist as a hotelNo value of HOTEL.

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guesNo,

e.,

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$ $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it
possible
to add
a new
room
i.e.
GUEST.

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guestNo,

- Is it possible to add a new room in the RELATION listed in the HOTEL relation?

Answer: Impossible because in ROOM: [

e.,

the hotelNo value of ROOM must exist as a hotelNo value of HOTEL.

- Is it possible to add a new hotel without any bookings or room information to the ACCOMMODATION database?

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Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$, $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it
possible
to add
a new
room
i.e.
GUEST.

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guestNo,

- Is it possible to add a new room in the ROOM relation listed in the HOTEL relation?

Answer: Impossible because in ROOM: [

e.,

the hotelNo value of ROOM must exist as a hotelNo value of HOTEL.

- Is it possible to add a new hotel without any bookings or room information to the ACCOMMODATION database?

Answer: Possible because none of the attributes in HOTEL(hotelNo, hotelName, city) references to any attribute in Room, GUEST and BOOKING.



Foreign Key (referential integrity) – Example

- Room: $[hotelNo] \subseteq HOTEL[hotelNo]$.
- BOOKING: $[hotelNo] \subseteq HOTEL[hotelNo]$, $[guestNo] \subseteq GUEST[guestNo]$,
 $[roomNo, hotelNo] \subseteq ROOM[roomNo, hotelNo]$.

- Is it
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GUEST.

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guestNo,

<https://eduassistpro.github.io>

- Is it possible to add a new room in the R listed in the HOTEL relation?

Answer: Impossible because in ROOM: [

e.,

the hotelNo value of ROOM must exist as a hotelNo value of HOTEL.

- Is it possible to add a new hotel without any bookings or room information to the ACCOMMODATION database?

Answer: Possible because none of the attributes in HOTEL(hotelNo, hotelName, city) references to any attribute in Room, GUEST and BOOKING.



Foreign Key (referential integrity) – Example

- In ENROL, [CourseNo] ⊑ COURSE[No] and [studentID] ⊑ STUDENT[StudentID].

Assignment Project Exam Help

STUDENT			

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COURSE		
No.	Cname	
COMP1130	Introduction to Advanced Computer Systems	
COMP2400	Relational Database Management Systems	

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ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate
456	COMP2400	2016 S2	active	25/05/2016
456	COMP1130	2016 S1	active	20/02/2016
459	COMP2400	2016 S2	active	11/06/2016



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	Date of Birth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
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StudentID	CourseNo	Semester	ENROL	
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Does the above database satisfy the foreign key of ENROL:
 $[StudentID] \subseteq STUDENT[StudentID]$?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	Date of Birth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
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StudentID	CourseNo	Semester	ENROL	
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Does the above database satisfy the foreign key of ENROL:
 $[StudentID] \subseteq STUDENT[StudentID]$?

Yes.



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENTS			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
----------	----------------------	---

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP3600	2016 S2	active	11/06/2016

Question: Does the above database satisfy the foreign key of ENROL:
 $[CourseNo] \subseteq COURSE[No]$?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	DOB	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP3600	2016 S2	active	11/06/2016

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Question: Does the above database satisfy the foreign key of ENROL:
 $[CourseNo] \subseteq COURSE[No]$?

No, because COMP3600 does not exist as a No value in COURSE.



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400		
Relational Databases		6

ENROL				
StudentID	CourseNo	Semester	Grade	DateEnrol
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we delete the first tuple in STUDENT?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400		
Relational Databases		6

ENROL				
StudentID	CourseNo	Semester	Grade	DateEnrol
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we delete the first tuple in STUDENT?

No, because it will violate the foreign key of ENROL: $[StudentID] \subseteq STUDENT[StudentID]$



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

Student ID	Name	Date of Birth	Email
456	Tom	25/07/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6

ENROL				
Student ID	Course No	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we delete the first tuple in ENROL?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	DateOfBirth	Email
456	Tom	25/07/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6

ENROL				
StudentID	CourseNo	Semester	Grade	DateEnrol
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we delete the first tuple in ENROL?

Yes.



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	STUDY.N	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we update COMP2400 to be COMP6240 in COURSE?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

StudentID	Name	STUDY.N	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2015 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Add WeChat [edu_assist_pro](https://eduassistpro.github.io)

Question: Can we update COMP2400 to be COMP6240 in COURSE?

No, because it will violate the foreign key of ENROL: [CourseNo] ⊂ COURSE[No].



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
----------	----------------------	---

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we insert a new course COMP3600 Algorithms with 6 units in COURSE?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DOB	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
----------	----------------------	---

ENROL				
StudentID	CourseNo	Semester	Grade	Date
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: Can we insert a new course COMP3600 Algorithms with 6 units in COURSE?

Yes.



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
----------	----------------------	---

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ENROL				
StudentID	CourseNo	Semester	Grade	DateEnrol
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: The foreign key StudentID in Enrol references StudentID in Student. The StudentID values in Enrol must be distinct?



Foreign Key (referential integrity) – Example

Assignment Project Exam Help

STUDENT			
StudentID	Name	DateOfBirth	Email
456	Tom	25/01/1988	tom@gmail.com
458	Peter	23/05/1993	peter@gmail.com

COMP2400	Relational Databases	6
----------	----------------------	---

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ENROL				
StudentID	CourseNo	Semester	Grade	DateEnrol
456	COMP2400	2016 S2		
458	COMP1130	2016 S1		
458	COMP2400	2016 S2	active	11/06/2016

Question: The foreign key StudentID in Enrol references StudentID in Student. The StudentID values in Enrol must be distinct?

No.



Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

- Consider the following relation schemas:

- Room(roomNo, hotelName, type, price) with the primary key

<https://eduassistpro.github.io>

01	Sydney	twin	200
02	Sydney	single	100
01	Canberra	single	150

guestNo	date	roomNo	hotelName
P1			ey
P2			erra

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Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

- Consider the following relation schemas:

- ROOM(roomNo, hotelName, type, price) with the primary key

<https://eduassistpro.github.io>

01	Sydney	twin	200
02	Sydney	single	100
01	Canberra	single	150

guestNo	date	roomNo	hotelName
P1			ey
P2			erra

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Now we add the following foreign key constraint:

- BOOKING[roomNo, hotelName] ⊆ ROOM[roomNo, hotelName]



Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

- Consider the following relation schemas:

- ROOM(roomNo, hotelName, type, price) with the primary key

<https://eduassistpro.github.io>

01	Sydney	twin	200
02	Sydney	single	100
01	Canberra	single	150

guestNo	date	roomNo	hotelName
P1			ey
P2			erra

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Now we add the following foreign key constraint:

- BOOKING[roomNo, hotelName] ⊆ ROOM[roomNo, hotelName]
- Is the above **equivalent** to:
BOOKING[roomNo] ⊆ ROOM[roomNo], and
BOOKING[hotelName] ⊆ ROOM[hotelName] ?



Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

roomNo	hotelName	type	price
01	Sydney	twin	200

guestNo	date	roo	
P1	30/07/2018	0	
P2	31/07/2018	0	

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Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

<https://eduassistpro.github.io>

ROOM			
roomNo	hotelName	type	price
01	Sydney	twin	200

guestNo	date	roo	
P1	30/07/2018	0	
P2	31/07/2018	0	

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- The above relations satisfy the foreign keys:
 - $\text{BOOKING}[\text{roomNo}] \subseteq \text{ROOM}[\text{roomNo}]$, and
 - $\text{BOOKING}[\text{hotelName}] \subseteq \text{ROOM}[\text{hotelName}]$



Foreign Key (referential integrity) – A Common Pitfall

Assignment Project Exam Help

<https://eduassistpro.github.io>

roomNo	hotelName	type	price
01	Sydney	twin	200
guestNo	date	roo	
P1	30/07/2018	0	
P2	31/07/2018	0	

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- The above relations satisfy the foreign keys:
 - $\text{BOOKING}[\text{roomNo}] \subseteq \text{ROOM}[\text{roomNo}]$, and
 - $\text{BOOKING}[\text{hotelName}] \subseteq \text{ROOM}[\text{hotelName}]$

but does not satisfy the foreign key:

- $\text{BOOKING}[\text{roomNo}, \text{hotelName}] \subseteq \text{ROOM}[\text{roomNo}, \text{hotelName}]$



Assignment Project Exam Help

(5) SQL Data Definition Language

(v.

<https://eduassistpro.github.io>

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Data Definition Language – Relation Schema

Assignment Project Exam Help

- Create a relation schema ENROL

https://eduassistpro.github.io

StudentID	CourseNo	Seme		
NG,				

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Data Definition Language – Relation Schema

Assignment Project Exam Help

- Create a relation schema ENROL

https://eduassistpro.github.io

StudentID	CourseNo	Seme			
-----------	----------	------	--	--	--

- The `CREATE TABLE` statement is used to create a relation schema specifying its name, its attributes and, optional constraints.

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```
CREATE TABLE Enrol(StudentID INT, CourseNo VARCHAR(20), Semester VARCHAR(50), Status VARCHAR(50), EnrolDate DATE);
```



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

•

<https://eduassistpro.github.io>

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

•

<https://eduassistpro.github.io>

- Can we use the following CREATE TABLE relation schema?

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CREATE TABLE Enrol(StudentID, CourseN
EnrolDate);



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

•

<https://eduassistpro.github.io>

- Can we use the following CREATE TABLE relation schema?

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```
CREATE TABLE Enrol(StudentID, CourseN  
EnrolDate);
```

- **No** because the data type is required for each attribute.



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

-

NG,

<https://eduassistpro.github.io>

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

-

NG,

<https://eduassistpro.github.io>

- Which of the following CREATE TABLE s

- ① CREATE TABLE Enrol(StudentID INT,
Semester VARCHAR(50), Status VARCHAR)
- ② CREATE TABLE Enrol(StudentID INT, CourseNo VARCHAR(20),
Semester VARCHAR(50), Status VARCHAR(50), EnrolDate DATE,);
- ③ CREATE TABLE Enrol(StudentID INT, CourseNo VARCHAR(20),
Semester VARCHAR(50), Status VARCHAR(50), EnrolDate DATE),

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

- **Enrol**(StudentID: INT, CourseNo: STRING, Semester: STRING,

<https://eduassistpro.github.io>

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL
 - **Enrol**(StudentID: INT, CourseNo: STRING, Semester: STRING,

<https://eduassistpro.github.io>

- None of the following **CREATE TABLE** st

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL
 - **Enrol**(StudentID: INT, CourseNo: STRING, Semester: STRING,

<https://eduassistpro.github.io>

- None of the following CREATE TABLE st

① CREATE TABLE Enrol (StudentID INT,
Semester VARCHAR(50), status VAR

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL
 - **Enrol**(**StudentID**: INT, **CourseNo**: STRING, **Semester**: STRING,

<https://eduassistpro.github.io>

- None of the following CREATE TABLE st

① CREATE TABLE Enrol(**StudentID** INT,
Semester VARCHAR(50), **Status** VAR
② CREATE TABLE **Enrol**(**StudentID** INT, **CourseNo** VARCHAR(20),
Semester VARCHAR(50), **Status** VARCHAR(50), **EnrolDate** DATE,);



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL
 - **Enrol**(StudentID: INT, CourseNo: STRING, Semester: STRING,

<https://eduassistpro.github.io>

- None of the following CREATE TABLE st

- ① CREATE TABLE Enrol(StudentID INT,
Semester VARCHAR(50), Status VAR
- ② CREATE TABLE **Enrol**(StudentID INT, CourseNo VARCHAR(20),
Semester VARCHAR(50), Status VARCHAR(50), EnrolDate DATE,);
- ③ CREATE TABLE **Enrol**(StudentID INT, CourseNo VARCHAR(20),
Semester VARCHAR(50), Status VARCHAR(50), EnrolDate DATE),

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relational schema ENROL

Enrol(**StudentID**: INT, **CourseNo**: STRING, **Semester**: STRING,
Status: STRING, **EnrolData**: DATE)

<https://eduassistpro.github.io>

- The correct CREATE TABLE statement

CREATE TABLE Enrol(**StudentID** INT, **Cours**
Semester VARCHAR(50), **Status** VARCHAR(50), **E**

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

Enrol(**StudentID**: INT, **CourseNo**: STRING, **Semester**: STRING,
Status: STRING, **EnrolData**: DATE)

<https://eduassistpro.github.io>

- The correct **CREATE TABLE** statement

CREATE TABLE **Enrol**(**StudentID** INT, **Cours**
Semester VARCHAR(50), **Status** VARCHAR(50), **E**)

- What about the following two **CREATE TA**

create table **Enrol**(**StudentID** int, **CourseNo** varchar(20),
Semester varchar(50), **Status** varchar(50), **EnrolDate** date);

CREATE TABLE **enrol**(**studentid** INT, **courseno** VARCHAR(20),
semester VARCHAR(50), **status** VARCHAR(50), **enroldate** DATE);



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Create a relation schema ENROL

Enrol(**StudentID**: INT, **CourseNo**: STRING, **Semester**: STRING,
Status: STRING, **EnrolData**: DATE)

<https://eduassistpro.github.io>

- P unless we use double quotes.

create table enrol(**studentid** int, **course** varchar(50),
semester varchar(50), **status** varchar(50), **enrol**

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Can we create two relation schemas with the same name in the same database?

CR
Se <https://eduassistpro.github.io>

```
create table enrol(studentid int, cours  
semester varchar(50), status varchar(50), e
```

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Can we create two relation schemas with the same name in the same database?

CR
Se

<https://eduassistpro.github.io>

```
create table enrol(studentid int, cours  
semester varchar(50), status varchar(50), e
```

- No. Add WeChat edu_assist_pro with the following error message:

```
u1024708=> create table enrol(studentid int, courseno varchar(20),  
u1024708(> semester varchar(50), status varchar(50), enroldate date);  
ERROR: relation "enrol" already exists
```



Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Can we create the following two relation schemas in the same database?

<https://eduassistpro.github.io>

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Data Definition Language – CREATE TABLE

Assignment Project Exam Help

- Can we create the following two relation schemas in the same database?

<https://eduassistpro.github.io>

- Yes, Enrol and "Enrol" are different.

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Data Definition Language – Relational Database Schema

Assignment Project Exam Help

- A relational database schema S is

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•
•

<https://eduassistpro.github.io>

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COURSE	
No	Crane

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate



Data Definition Language – Domain Constraints

Assignment Project Exam Help

STUDENT				
StudentID	Name	DOB	Email	

<https://eduassistpro.github.io>

StudentID	CourseNo	Semester	Status	EnrolDate

```
CREATE TABLE STUDENT(StudentID INT, Name VARCHAR(50), Email VARCHAR(100));
```

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```
CREATE TABLE COURSE(No VARCHAR(20), Cname VARCHAR(50), Unit SMALLINT);
```

```
CREATE TABLE ENROL(StudentID INT, CourseNo VARCHAR(20), Semester VARCHAR(50), Status VARCHAR(50));
```



Data Definition Language – Key Constraints

Assignment Project Exam Help

<https://eduassistpro.github.io>

- **UNIQUE:** Uniquely identify each tuple in a table.

Every superkey is UNIQUE. Should we specify?

STUDENT

StudentID	Name	DoB	Email
-----------	------	-----	-------



Data Definition Language – Key Constraints

Assignment Project Exam Help

CRE

<https://eduassistpro.github.io>

```
Email VARCHAR(100),  
UNIQUE(StudentID),  
UNIQUE(Email),  
UNIQUE(StudentID, Email),  
UNIQUE(StudentID, Name),  
UNIQUE(StudentID, DoB),  
...  
UNIQUE(StudentID, Name, DoB, Email));
```

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Data Definition Language – Candidate Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- **UN**
 - **S**
 - **Fo**
 - **STUDENT**
- <https://eduassistpro.github.io>**

```
CREATE TABLE STUDENT
(StudentID INT
Name VARCHAR(50),
DoB Date,
Email VARCHAR(100),
UNIQUE(StudentID),
UNIQUE(Email));
```

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Data Definition Language – Candidate Key

Assignment Project Exam Help

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate

- {S <https://eduassistpro.github.io/>

```
CREATE TABLE ENROL
    (StudentID INT ,
     CourseNo VARCHAR(20),
     Semester VARCHAR(50),
     Status VARCHAR(50),
     EnrolDate DATE,
     UNIQUE(StudentID, CourseNo, Semester));
```

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Data Definition Language – Primary Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- P
- Fo
S <https://eduassistpro.github.io>

```
CREATE TABLE STUDENT
(StudentID INT,
Name VARCHAR(50),
DoB Date,
Email VARCHAR(100),
PRIMARY KEY(StudentID),
UNIQUE>Email));
```

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Data Definition Language – Primary Key

Assignment Project Exam Help

ENROL				
StudentID	CourseNo	Semester	Status	EnrolDate

- {S <https://eduassistpro.github.io/>

```
CREATE TABLE ENROL
    (StudentID INT ,
     CourseNo VARCHAR(20),
     Semester VARCHAR(50),
     Status VARCHAR(50),
     EnrolDate DATE,
     PRIMARY KEY(StudentID, CourseNo, Semester));
```

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Data Definition Language – Primary Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- C <https://eduassistpro.github.io/>

```
(StudentID INT,  
Name VARCHAR(50),  
DoB Date,  
Email VARCHAR(100),  
PRIMARY KEY(StudentID),  
PRIMARY KEY>Email));
```

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Data Definition Language – Primary Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- C <https://eduassistpro.github.io>

```
(StudentID INT,  
Name VARCHAR(50),  
DoB Date,  
Email VARCHAR(100),  
PRIMARY KEY(StudentID),  
PRIMARY KEY>Email));
```

- No because multiple primary keys for the same relation schema are not allowed.

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Data Definition Language – Candidate Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- C <https://eduassistpro.github.io>

```
(StudentID INT,  
Name VARCHAR(50),  
DoB Date,  
Email VARCHAR(100),  
UNIQUE(StudentID),  
UNIQUE>Email));
```

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Data Definition Language – Candidate Key

Assignment Project Exam Help

STUDENT			
StudentID	Name	DoB	Email

- C <https://eduassistpro.github.io>

```
(StudentID INT,  
Name VARCHAR(50),  
DoB Date,  
Email VARCHAR(100),  
UNIQUE(StudentID),  
UNIQUE>Email));
```

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- Yes because multiple candidate keys (or superkeys) for the same relation schema are allowed.



Data Definition Language – Entity Integrity Constraints

Assignment Project Exam Help

- **Entity integrity constraints:** no primary key value can be NULL.

<https://eduassistpro.github.io>

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Data Definition Language – Entity Integrity Constraints

Assignment Project Exam Help

- **Entity integrity constraints:** no primary key value can be NULL.
- C

<https://eduassistpro.github.io>

Semester VARCHAR(50),

Status VARCHAR(50),

Enro Date DATE,

PRIMARY KEY(StudentID, Cours)

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Data Definition Language – Entity Integrity Constraints

Assignment Project Exam Help

- **Entity integrity constraints:** no primary key value can be NULL.
- C

<https://eduassistpro.github.io>

Semester VARCHAR(50),

Status VARCHAR(50),

Enro Date DATE,

PRIMARY KEY(StudentID, Cours)

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- No. None of the columns listed in the primary key can be NULL.



Data Definition Language – Entity Integrity Constraints

- What about UNIQUE constraints?

Assignment Project Exam Help

<https://eduassistpro.github.io>

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Data Definition Language – Entity Integrity Constraints

Assignment Project Exam Help

- What about UNIQUE constraints?
- Can the StudentID value be NULL?

<https://eduassistpro.github.io>

```
Email VARCHAR(100),  
UNIQUE(StudentID),  
UNIQUE>Email);
```

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Data Definition Language – Entity Integrity Constraints

Assignment Project Exam Help

- What about UNIQUE constraints?
- Can the StudentID value be NULL?

<https://eduassistpro.github.io>

```
Email VARCHAR(100),  
UNIQUE(StudentID),  
UNIQUE>Email))
```

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- In PostgreSQL, two NULL values are not considered equal. That means even in the presence of a unique constraint it is possible to store duplicate rows that contain a null value in at least one of the constrained columns.
But other SQL databases might not follow this rule and be careful when developing applications that are intended to be portable.



Data Definition Language – Referential Integrity

Constraints

Assignment Project Exam Help

- **Referential integrity constraints:** the values in a column (or a group of columns) in one table must match the values appearing in some row of another table.

CREATE TABLE STUDENT
DoB Date

<https://eduassistpro.github.io>

CREATE TABLE COURSE(CourseNo VARCHAR(20) PRIMARY KEY,
UnitSize INT);

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CREATE TABLE ENROL(StudentID INT, CourseNo VARCHAR(20),
Semester VARCHAR(50), Status VARCHAR(50));

- Every StudentID appearing in ENROL must exist in STUDENT.
- Every CourseNo appearing in ENROL must exist in COURSE.



Data Definition Language – Foreign Key

```
CREATE TABLE STUDENT
```

```
( StudentID INT PRIMARY KEY
```

```
    Name VARCHAR(50),
```

```
    DoB Date,
```

```
CRE
```

<https://eduassistpro.github.io>

```
    Cname VARCHAR(50),
```

```
    Unit SMALLINT);
```

```
CREATE TABLE ENROL
```

```
( StudentID INT,
```

```
    CourseNo VARCHAR(20),
```

```
    Semester VARCHAR(50),
```

```
    Status VARCHAR(50),
```

```
    FOREIGN KEY(StudentID) REFERENCES STUDENT(StudentID),
```

```
    FOREIGN KEY(CourseNo) REFERENCES COURSE(CourseNo));
```

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Data Definition Language – Foreign Key

```
CREATE TABLE STUDENT
```

```
( StudentID INT PRIMARY KEY
```

```
    Name VARCHAR(50),
```

```
    DoB Date,
```

```
CRE
```

<https://eduassistpro.github.io>

```
    Cname VARCHAR(50),
```

```
    Unit SMALLINT);
```

```
CREATE TABLE ENROL
```

```
( StudentID INT,
```

```
    CourseNo VARCHAR(20),
```

```
    Semester VARCHAR(50),
```

```
    Status VARCHAR(50),
```

```
    FOREIGN KEY(StudentID) REFERENCES STUDENT(StudentID),
```

```
    FOREIGN KEY(CourseNo) REFERENCES COURSE(CourseNo));
```



Data Definition Language – Foreign Key

```
CREATE TABLE STUDENT
```

```
( StudentID INT PRIMARY KEY
```

```
    Name VARCHAR(50),
```

```
    DoB Date,
```

```
CRE
```

<https://eduassistpro.github.io>

```
    Cname VARCHAR(50),
```

```
    Unit SMALLINT);
```

```
CREATE TABLE ENROL
```

```
( StudentID INT,
```

```
    CourseNo VARCHAR(20),
```

```
    Semester VARCHAR(50),
```

```
    Status VARCHAR(50),
```

```
    FOREIGN KEY(StudentID) REFERENCES STUDENT(StudentID),
```

```
    FOREIGN KEY(CourseNo) REFERENCES COURSE(CourseNo));
```

constraint.



Attribute Constraints – Foreign Key

CREATE TABLE ENROL

(StudentID INT,
CourseNo VARCHAR(20),
Semester VARCHAR(50),

<https://eduassistpro.github.io>

CREATE TABLE STUDENT

(StudentID INT PRIMARY KEY,
Name VARCHAR(50),
Dob Date,
Email VARCHAR(100));

CREATE TABLE COURSE

(No VARCHAR(20) PRIMARY KEY,
Cname VARCHAR(50),
Unit SMALLINT);

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Attribute Constraints – Foreign Key

CREATE TABLE ENROL

(StudentID INT,
CourseNo VARCHAR(20),
Semester VARCHAR(50),

<https://eduassistpro.github.io>

CREATE TABLE STUDENT

(StudentID INT PRIMARY KEY,
Name VARCHAR(50),
Dob Date,
Email VARCHAR(100));

CREATE TABLE COURSE

(No VARCHAR(20) PRIMARY KEY,
Cname VARCHAR(50),
Unit SMALLINT);

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reference STUDENT and COURSE.



Create Index (optional reading, will not be accessed)

Assignment Project Exam Help

CREATE INDEX constructs an index on the specified column(s) of the specified table.

In Post

<https://eduassistpro.github.io>

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<https://www.postgresql.org/docs/12/sql-createindex.html>



Create Index (optional reading, will not be accessed)

Assignment Project Exam Help

CREATE INDEX constructs an index on the specified column(s) of the specified table.

How to u

<https://eduassistpro.github.io>

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https://en.wikipedia.org/wiki/Binary_search_tree



Create Index (optional reading, will not be accessed)

CREATE INDEX constructs an index on the specified column(s) of the specified table.

How to use '**Hash Function**' to construct an index?

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(credit cookie) René Descartes and the Cartesian Product

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https://en.wikipedia.org/wiki/Ren%C3%A9_Descartes



René Descartes

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René Descartes

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René Descartes (Reneatus Cartesius; 1596 – 1650) was a French
Philosopher: Cogito Ergo Sum ("I think, therefore I am")

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- **Scientist:** "contact" lenses

