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**CS 311 Discrete Math and Data Structures:**

**Homework6**

1. List the ordered pairs in the relation R from A= {0,1,2,3,4}to B = {0,1,2,3}, where (a, b) ∈R if and only if

a) a =b: R= {(0,0), (1,1), (2,2), (3,3)}

b) a + b =4: R= {(1,3), (2, 2), (3,1), (4,0)

c) a>b: R= {(1,0), (2,0), (3,0), (4,0), (2,1), (3, 1), (3,2), (4,1), (4,2), (4,3)}

d) a | b: R= {(1,0), (2,0), (3,0), (4,0), (1,1), (1,2), (2,2), (1,3), (3,3)}

1. For each of these relations on the set {1,2,3,4}, decide whether it is reﬂexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.
2. {(2,2), (2,3), (2,4), (3,2), (3,3), (3,4)}

transitive

1. {(1,1), (1,2), (2,1), (2,2), (3,3), (4,4)}

reﬂexive, symmetric and transitive

1. {(2,4), (4,2)}

symmetric

1. {(1,2), (2,3), (3,4)}

antisymmetric

1. {(1,1), (2,2), (3,3), (4,4)}

reﬂexive, symmetric, antisymmetric and transitive.

1. {(1,3), (1,4), (2,3), (2,4), (3,1), (3, 4)}: None

6. Determine whether the relation R on the set of all real numbers is reﬂexive, symmetric, antisymmetric, and/or transitive, where (x, y) ∈R if and only if

a) x +y =0

Symmetric

b) x =± y. Reflexive, Symmetric and Transitive.

30. Let R1 = {(1,2), (2,3), (3,4)}

and R2 = {(1,1), (1,2), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3), (3,4)}

be relations from {1,2,3} to {1,2,3,4}. Find

a) R1∪R2: {(1,1), (1,2), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3), (3,4)}

b) R1∩R2: {(1,2), (2,3), (3,4)}

c) R1−R2: {}

d) R2−R1: {(1,1), (2,1), (2,2), (3,1), (3,2), (3,3)}

32. Let R be the relation {(1,2), (1,3), (2,3), (2,4), (3,1)}, and let S be the relation {(2,1), (3,1), (3,2), (4,2)}. Find S ◦R: {(1,1), (1,2), (2,1), (2,2)

1. List the triples in the relation {(a, b, c) | a, b, and c are integers with 0 <a<b<c<5}

R: {(1, 2, 3), (1, 2, 4), (1, 3, 4), (2, 3, 4)}

8. The 4-tuples in a 4-ary relation represent these attributes of published books: title, ISBN, publication date, number of pages.

a) What is a likely primary key for this relation? ISBN number

b) Under what conditions would (title, publication date) be a composite key?

When all books with the same title have a different publication date.

c) Under what conditions would (title, number of pages) be a composite key?

When all books with the same title have a different number of pages.

10. What do you obtain when you apply the selection operators C, where C is the condition Room=A100, to the database in Table 7?

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14. What do you obtain when you apply the projection P2,3,5 to the 5-tuple (a, b, c, d, e)?: (b, c ,e)

1. Represent each of these relations on {1, 2, 3} with a matrix (with the elements of this set listed in increasing order).

a) {(1,1), (1,2), (1,3)}:

b) {(1,2), (2,1), (2,2), (3,3)}:

c) {(1,1), (1,2), (1,3), (2,2), (2,3), (3,3)}:

d) {(1,3), (3,1)}:

1. List the ordered pairs in the relations on {1,2, 3} corresponding to these matrices (where the rows and columns correspond to the integers listed in increasing order).
2. R1= {(1,1), (1,3), (2,2), (3,1), (3,3)}
3. R2= {(1,2), (2,2), (3,2)}

14. Let R1 and R2 be relations on a set A represented by the matrices

Find the matrices that represent

MR1=

MR2=

a) R1∪R2:

b) R1∩R2:

c) R2◦R1: