

DISCRETE MATHEMATICS -411 ASSIGNMENT NO.5

CHAPTER 9-EXERCISE 9.1

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

- a) $a = b$.
- b) $a + b = 4$.
- c) $a > b$.
- d) $a \mid b$.

3. 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.

- d) $\{(1, 2), (2, 3), (3, 4)\}$
- e) $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$
- f) $\{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$

5. Determine whether the relation R on the set of all Web pages is reflexive, symmetric, antisymmetric, and/or transitive, where $(a, b) \in R$ if and only if

- a) everyone who has visited Web page a has also visited Web page b .
- b) there are no common links found on both Web page a and Web page b .
- c) there is at least one common link on Web page a and Web page b .
- d) there is a Web page that includes links to both Web page a and Web page b .

7. Determine whether the relation R on the set of all integers is reflexive, symmetric, antisymmetric, and/or transitive, where $(x, y) \in R$ if and only if

- d) $x \equiv y \pmod{7}$.
- e) x is a multiple of y .
- f) x and y are both negative or both nonnegative.
- g) $x = y^2$.
- h) $x \geq y^2$.

13. Which relations in Exercise 5 are irreflexive?

18. Which relations in Exercise 3 are asymmetric?

27. Let R be the relation $R = \{(a, b) \mid a \text{ divides } b\}$ on the set of positive integers. Find

- a) R^{-1} .
- b) R .

31. Let A be the set of students at your school and B the set of books in the school library. Let R_1 and R_2 be the relations consisting of all ordered pairs (a, b) , where student a is required to read book b in a course, and where student a has read book b , respectively. Describe the ordered pairs in each of these relations.

- a) $R_1 \cup R_2$
- b) $R_1 \cap R_2$
- c) $R_1 \oplus R_2$
- d) $R_1 - R_2$
- e) $R_2 - R_1$