Self-Assessment Quiz: Relations and Equivalence Relations (Lecture 8)

Ungraded Quiz – For Practice and Understanding

Q1. A binary relation R on a set A is called **reflexive** if:

(a) $(a, b) \in R$ implies $(b, a) \in R$

(b) $(a, a) \in R$ for all $a \in A$

(c) $(a, b), (b, c) \in R$ implies $(a, c) \in R$

(d) $(a, b) \notin R$ for all $a, b \in A$

Q2. A relation R is **symmetric** if:

(a) $(a, b) \in R$ and $(b, a) \notin R$

(b) $(a, b) \in R$ implies $(b, a) \in R$

(c) $(a, b), (b, c) \in R$ implies $(a, c) \in R$

(d) $(a, a) \in R$ for all a

Q3. A relation R is **transitive** if:

(a) $(a, b), (b, c) \in R$ implies $(a, c) \in R$

(b) $(a, b) \in R$ implies $(b, a) \in R$

(c) $(a, a) \in R$

(d) $(a, b), (b, c) \notin R$

Q4. Which of the following relations on $\{1, 2, 3, 4\}$ is **not symmetric**?

(a) $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$

(b) $\{(1, 3), (3, 1), (2, 4), (4, 2)\}$

(c) $\{(1, 2), (2, 3)\}$

(d) $\{(1, 1), (3, 3), (2, 2)\}$

Q5. The relation "is less than" $(<)$ on $\mathbb{R}$ is:

(a) Reflexive and symmetric

(b) Symmetric and transitive

(c) Not reflexive nor symmetric but transitive

(d) Reflexive and transitive

Q6. Let R be the relation on $\mathbb{Z}^+$ defined by aRb iff $a \times b$ is odd. Then R is:

(a) Reflexive only

(b) Symmetric only

(c) Transitive only

(d) Both symmetric and transitive

Q7. The "divides" relation ($|$) on $\mathbb{Z}$ is:

(a) Reflexive and symmetric

(b) Reflexive and transitive

(c) Symmetric and transitive

(d) Only symmetric

Q8. Let A be the set of all people, and R be the relation "has the same first name as." Then R is:

(a) Reflexive only

(b) Symmetric only

(c) Transitive only

(d) Reflexive, symmetric, and transitive

Q9. A relation that is **reflexive, symmetric, and transitive** is called:

(a) An equivalence relation

(b) A partial order

(c) A symmetric closure

(d) A bijective mapping

Q10. Which of the following is **not** required for a relation to be an equivalence relation?

(a) Reflexivity

(b) Symmetry

(c) Transitivity

(d) Antisymmetry

Q11. The relation "parallel to" between lines in a plane is:

(a) Reflexive and symmetric only

(b) Symmetric and transitive only

(c) Reflexive, symmetric, and transitive

(d) None of these

Q12. If $R = \{(a, b) | a = b\}$ on any non-empty set A, then R is:

(a) Only reflexive

(b) Reflexive and symmetric

(c) Symmetric and transitive

(d) Reflexive, symmetric, and transitive

Q13. The complement of a symmetric relation is:

(a) Always symmetric

(b) Never symmetric

(c) Sometimes symmetric

(d) Transitive

Q14. If R is a relation such that $(a, b) \in R$ and $(b, a) \in R$ for all a, b, but not all $(a, a) \in R$, then R is:

(a) Symmetric only

(b) Reflexive only

(c) Transitive only

(d) Equivalence relation

Answers (for self-check):
1(b), 2(b), 3(a), 4(c), 5(c), 6(d), 7(b), 8(d), 9(a), 10(d), 11(c), 12(d), 13(c), 14(a)