ÖDEV-1
Problemleri çözünüz 1.1.1- 1.1.4 (sayfa 8-9)
Problemleri çözünüz 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.3.9 (sayfa 20-21)

ÇÖZÜMLER

1.1.1. Determine whether each of the following is true / false (ODEV-1)

a) $\emptyset \subseteq \emptyset$
Yes it is true. The null set (empty set) is a subset of all sets.

b) $\emptyset \in \emptyset$
False. An empty set is a set with no elements.

c) $\emptyset \in \{\emptyset\}$
Yes. $\emptyset$ is empty set with cardinality 0. However, {$\emptyset$} is a set with one element $\emptyset$.

d) $\emptyset \subseteq \{\emptyset\}$
Yes. The null set (empty set) is a subset of all sets.

e) $\{a, b\} \in \{a, b, c, \{a, b\}\}$
Yes. As { {a,b} } is an element of $\{a, b, c, \{a, b\}\}$**.**

f) $\{a, b\} \subseteq \{a, b, \{a, b\}\}$
Yes. As {a,b} is an element of $\{a, b, c, \{a, b\}\}$

g) $\{a, b\} \subseteq Power\ set\ of\ \{a, b, \{a, b\}\}$
Yes.

h) $\{\{a, b\}\} \in Power\ set\ of\ \{a, b, \{a, b\}\}$
Yes.

i) $\{a, b, \{a, b\}\} - \{a, b\} = \{a, b\}$
False. It must be { {a,b} }

1. 1.2.

(a) {3, 5}
(b) {3, 5, 7}
(c) {1, 2, 7, 9}
(d) {8}, {7, 8}, {8, 9}, {7, 8, 9}
(e) {∅}
(f) {0, 1, 4, 9, 25, 36…} (the perfect squares)
(g) ∅ (since the square root of 2 is not an integer)

1.1.3.

(a) $A \cup (B \cap C)$ $= (B \cap C) \cup A$ commutativity
$= (B \cup A) \cap (C \cup A)$ distributivity
$= (A \cup B) \cap (A \cup C)$ commutativity

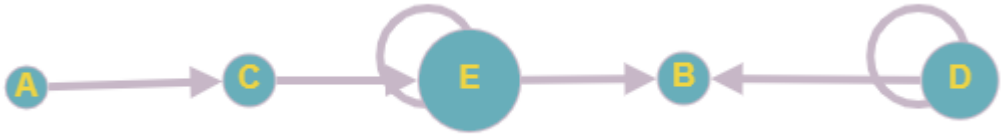
(b) $A \cap (B \cup C)$ $= (B \cup C) \cap A$ commutativity
$= (B \cap A) \cup (C \cap A)$ distributivity
$= (A \cap B) \cup (A \cap C)$ commutativity

(c) $A \cap (A \cup B)$ $= (A \cup B) \cap A$ commutativity
$= A$ absorption

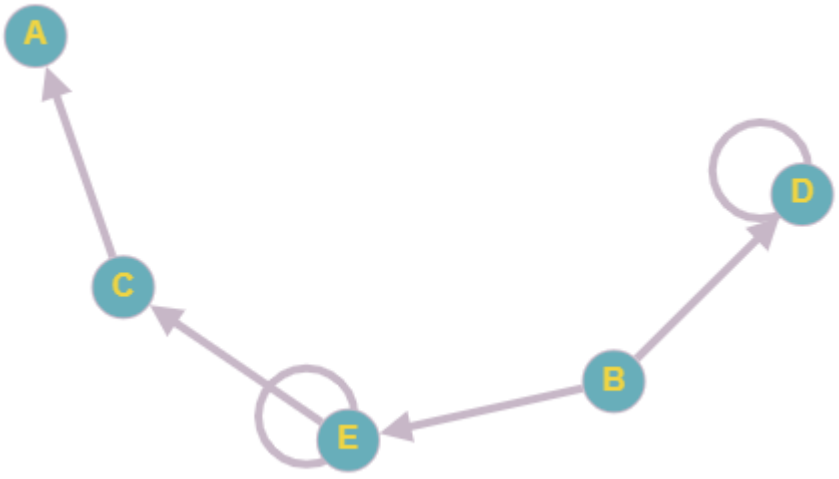
1.1.4. (a) {(1,1,1), (1,1,2), (1,1,3), (1,2,1), (1,2,2),, (1,2,3)}
(b) ∅
(c) {(∅,1), (∅,2), ({1}, 1), ({1}, 2), ({2}, 1), ({2}, 2), ({1,2}, 1), ({1,2}, 2)}

1.3.1.

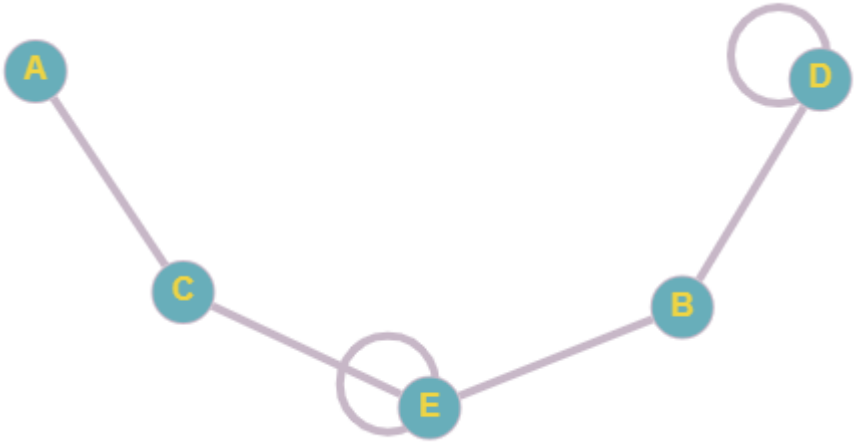
a) R={(a, c),(c, e),(e, e),(e, b),(d, b),(d, d)}



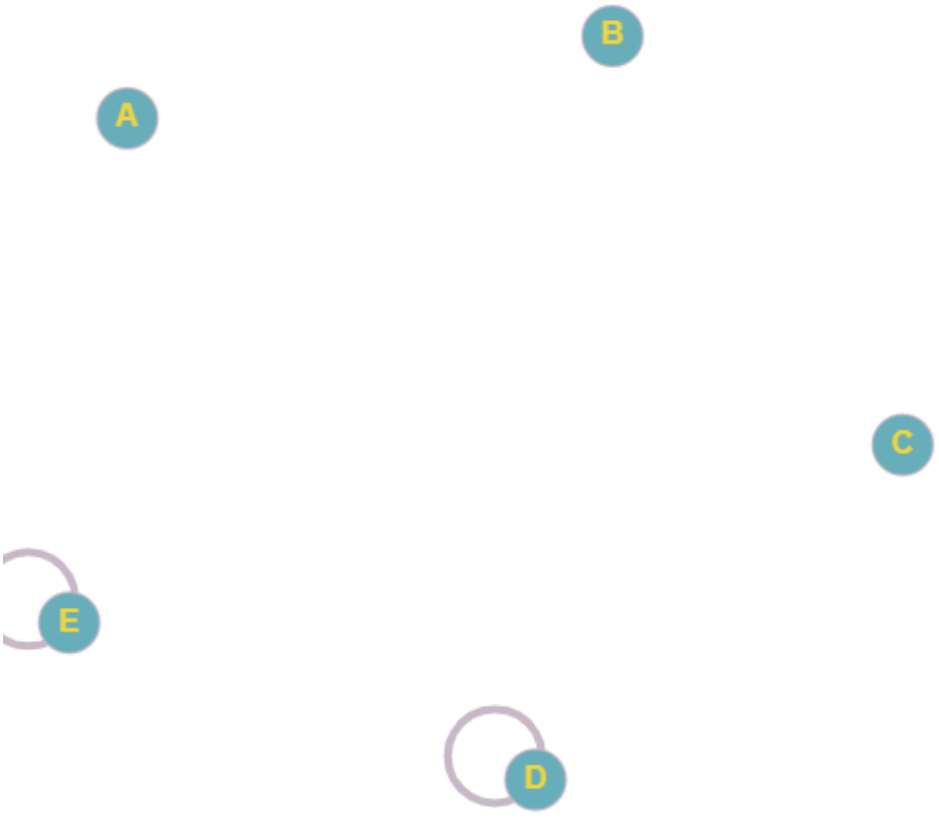
b) R^{-1}={(c,a),(e,c),(e, e),(b,e),(b,d),(d, d)}



c) RUR^{-1}={(a, c),(b,e),(b,d),(c, e),(c,a),(e,c),(e, e),(e, b),(d, b),(d, d)}



d) $R \cap R^{-1}=\{(e, e),(d, d)\}$

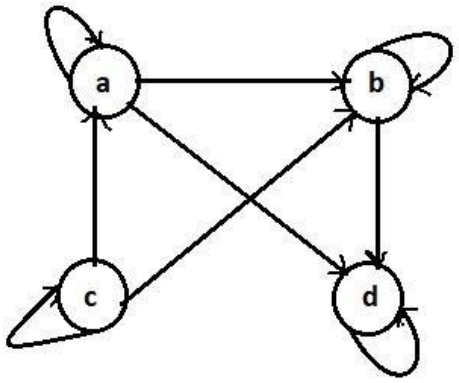


1.3.2.

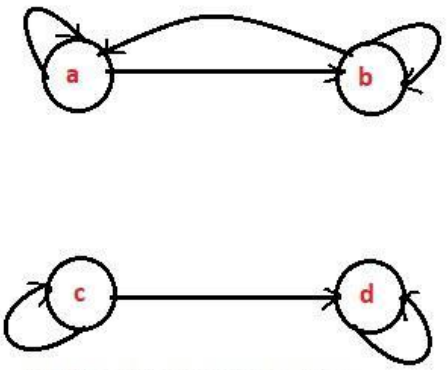
a) R is not reflexive, is not symmetric, is not transitive
S is not reflexive, is symmetric, is not transitive

b) RUS is reflexive, is not symmetric, is not transitive

1.3.3.



(Reflexive, transitive, and antisymmetric.)



(Reflexive, transitive, and neither symmetric nor antisymmetric.)

1.3.4.

Let us assume any set and any relation R for that set.
Let set A = {1, 2, 3, 4} and the relation for set A will be R = {(a, b): a + b = 10}
So, we observe that $a + b \neq 10$ for any two elements of set A.
Therefore $(a, b) \notin R$ for any $a, b \in A$.
R does not contain elements of $A \times A$. So, R will be the empty set.
And, R will be the empty relation on set A. So, empty relation is not reflexive because it does not contain (a, a) for any $a \in R$.
As we know the definition of symmetric relation that if A be a set in which the relation R is defined. Then R is said to be a symmetric relation, if $(a, b) \in R \Rightarrow (b, a) \in R$.
Now for empty relation R does not contain any element of set A. So, relation R will be trivially symmetric.
As we know the definition of transitive relation that a relation R over a set A is transitive if for all elements a, b, c in A. Whenever R relates a to b and b to c, then R also relates a to c.
So, a empty relation has no element. So, it will also be trivially transitive.
So, empty relation is not reflexive but is symmetric and transitive.