(II). Symmetric Relation –
A relation R in A is called a symmetric relation if for every $(x,y) \in R$, $(y,x) \in R$

Example —

(i) Let $A = \{1,2,3\}$.
Then $R = \{(1,2),(2,1),(3,3)\}$ is a relation in A.
Here,
$(1,2) \in R$, $(2,1) \in R$
$(2,1) \in R$, $(1,2) \in R$
$(3,3) \in R$, $(3,3) \in R$.
Thus for every $(x,y) \in R$, $(y,x) \in R$.
$\therefore$ R is a symmetric relation in A.

(ii) Let $A = \{1,2,3\}$
Then $R = \{(1,1),(1,3),(2,3)\}$ is a relation in A.
Here,
$(1,1) \in R$, $(1,1) \in R$
$(1,3) \in R$ but $(3,1) \notin R$.
$\therefore$ R is not a symmetric relation in A.

(III). Transitive Relation –
A relation R in A is called a transitive relation if for every (x,y) & $(y,z) \in R$, $(x,z) \in R$.

Example —
Let $A = \{1,2,3\}$
Then $R = \{(1,2),(2,3),(1,3)\}$ is a relation in A.

Here,
$(1,2)$ & $(2,3) \in R$, $(1,3) \in R$.
Thus for every (x,y) & $(y,z) \in R$, $(x,z) \in R$.
$\therefore$ R is a transitive relation in A.

(ii) Let $A = \{1, 2, 3\}$
Then $R = \{(1,1), (1,2), (2,3)\}$
is a relation in A.
Here,
$(1,1)$ & $(1,2) \in R$, $(1,2) \in R$.
$(1,2)$ & $(2,3) \in R$, but $(1,3) \notin R$
$\therefore$ R is not a transitive relation in A.

(IV) Equivalence Relation —
A relation R in A is called an equivalence relation if
(i) R is a reflexive relation in A
i.e., for every $x \in A$, $(x,x) \in R$
(ii) R is a symmetric relation in A
i.e., for every $(x,y) \in R$, $(y,x) \in R$ and
(iii) R is a transitive relation in A
i.e., for every (x,y) & $(y,z) \in R$, $(x,z) \in R$.