Page No.:
Date: / /

Rings

A non-empty set R, together with two binary composition '+' and '$\cdot$' is said to form a Ring if the following axioms are satisfied:

(i.) $a+(b+c) = (a+b)+c \ \forall \ a,b,c \in R$

(ii.) $a+b = b+a \ \forall \ a,b \in R$

(iii.) $\exists$ some element 0 (called zero) in R s.t. $a+0 = 0+a = a \ \forall \ a \in R$

(iv.) for each $a \in R$ $\exists$ an element $(-a) \in R$ s.t. $a+(-a) = (-a)+a = 0$

(v.) $a\cdot(b\cdot a) = \cancel{a\cdot b + a\cdot c}\ (a\cdot b)c \ \forall \ a,b,c \in R$

(vi) $a\cdot(b+c) = a\cdot b + a\cdot c$
$(b+c)\cdot a = b\cdot a + c\cdot a \ \forall \ a,b,c \in R.$

Commutative ring – A ring R is called a commutative Ring if $ab = ba \ \forall \ a,b \in R$.
Again if $\exists$ an element $e \in R$ s.t.
$$ae = ea = a \ \forall \ a \in R.$$

R is a ring with unity. Unity is generally denoted by 1. (It is also called unit element or multiplicative identity.)