SECTION – 3

Q1
Ans (a.) The Composition table of G is.

$*$	1	-1	i	$-i$
1	1	-1	i	$-i$
-1	-1	1	$-i$	i
i	i	$-i$	-1	1
$-i$	i	i	-1	1

1. Closure property: Since all the entries of the Composition table are the elements of the given set, the set G is closed under multiplication.

2. Associativity: The elements of G are Complex numbers, and we know that multiplication of Complex number is associative.

3. Identity : Here, 1 is the identity element.

4. Inverse: From the Composition table, we see the the inverse elements of $1, -1, i, -i$ are. $1, -1, -i, i$ respectively.

5. Commutativity: The Corresponding rows & Columns of the table are Identical. therefore the binary operation is commutative. Hence, (G,*) is an abelian group.

(6) Ring : A ring (R, +, .) is a set R together with two binary operation + (Addition) and (multiplication) defined on R such that the following axioms are satisfied:

(R_1) $(a+b)+c = a+(b+c)$ for all $a,b,c \in R$.
(R_2) $a+b = b+a$ for all $a,b \in R$.
(R_3) there exists an element 0 in R such that $a+0 = a$ for all $a \in R$.
(R_4) for all $a \in R$, there exist an element $-a \in R$ such that

$$a+(-a)=0.$$

(R_5) $(a.b).c = a.(b.c)$ for all $a,b,c \in R$.
(R_6) $a.(b+c) = (a.b) + (c.a)$ for all $a,b,c \in R$. (left distributive law)
(R_7) $(b+c).a = (b.a) + (c.a)$ for all $a,b,c \in R$. (Right distributive law).