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B.Sc PART-II PAPER III

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Concept of Subgroup and Cyclic groups

A non-empty subset H of a group G is said to be a subgroup of G if the composition in G is also a composition in H and for this composition H itself is a group.

Every set is a subset of itself. Therefore if G is a group, then G itself is a subgroup of G .

Note If e is the identity of G , then the subset of G containing only one element i.e. e is also a subgroup of G .

Ques What are the trivial and improper subgroups of a group?

Ans The group G itself and $G = \{e\}$.

Ques What is called Proper subgroup?

Ans All other subgroups of a group except the trivial and improper subgroups of a group are called proper subgroups.

Prove that

(A)

The identity of a subgroup is the same as that of the group.

Proof

Let H be a subgroup of the group G .

Let e & e' be the identities of G & H respectively.

Now $a \in H \Rightarrow e'a = a$ ($\because e'$ is identity of H)

Also $a \in H \Rightarrow a \in G \Rightarrow ea = a$

e in G we have $e'a = ea$

$\Rightarrow e' = e$ (by using right cancellation)