(4.)

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Properties of representations of a group:-

Let us consider the group G, then

$$EA = AE = A \quad \forall \; E, A \in G$$

In terms of the matrix representation i.e

$$T(E).T(A) = T(A)\,T(E) = T(A)$$

The matrix $T(E)$ is satisfied only if $T(E) = E$ the unit matrix. Thus, in any representation, the identity element of the group must be done representation by the unit matrix of the appropriate order. Let us take $A^{-1} \in G$

$$T(A)\,T(A^{-1}) = T(AA^{-1}) = T(E) = E$$

or $\quad T(A^{-1}) = [T(A)]^{-1}$

Thus it is said that the matrix representation the universe of an element is equal to the inverse of the matrix representing the element.

Let us consider two representations of the group G which is given as

$T_1 = \{T_1(E), T_1(A), \ldots\}$ and $T_2 = \{T_2(E), T_2(A), \ldots\}$.

If there exists a non-singular matrix S such that

$$T_1(A) = S^{-1}T_2(A)\,S, \; T_1(B) = S^{-1}T_2(B)\,S \quad \text{etc}$$

$$\forall \; A \in G$$

then T_1 and T_2 are said to be equivalent representations of G. This means that the matrix of the first set can be obtained