ON RATIONAL NONLINEAR CHARACTERS OF FROBENIUS GROUPS

H. SHARIFI AND M. NOROOZ-ABADIAN

Department of Mathematics, Faculty of Science, Shahed University, Tehran, Iran. hsharifi@shahed.ac.ir

ABSTRACT. We receive some results on Frobenius groups whose irreducible complex nonlinear characters are rational valued.

Keywords: Q-group, Ql-group, Frobenius group

1. INTRODUCTION

Let $G$ be a finite group all whose its irreducible characters are rational valued. We call such a group a rational group or Q-group. In this paper, we generalize Q-groups to Ql-groups by imposing rationality merely on nonlinear characters. For the first time, notation of Ql-group is introduced in ([2], page 61), nevertheless, there is no theorem or result about Ql-groups in this book. Darafsheh et al. [7], obtained some results about the structure of Ql-groups.

2. PRELIMINARY AND A REVIEW ON RECENT WORKS

Throughout the paper, we use the following notations and terminologies: $K : H$ stands for the semi-direct product of the groups $K$ and $H$. The symbol $Z_n$ denotes a cyclic group of order $n$. The symbol $E(p^n)$, denotes the elementary abelian $p$-group of order $p^n$, bing $p$ a prime number; $Q_{2n}$ is employed to denote the generalized quaternion group of order $2^n$, and $T_{4n} = \langle a, b | a^{2n} = 1, a^n = b^2, b^{-1}ab = a^{-1} \rangle$ for dicyclic group of order $4n$. Let us denote the Frobenius group with Frobenius kernel $K$ and Frobenius complement $H$, by $(K : H)$, and employ $G_p$ for $p$-Sylow subgroup of the finite group $G$. We use the notation Q'-group for a Q1-group which is not a Q-group. Examples of Q-l-group are some abelian groups and $A_4$, alternative group on four letters. Obviously, if irreducible linear characters of a finite group $G$ are rational valued then $G$ is Q-group if and only if it is Q1-group. For example, the group $Q_{2^n}$ is Q1-group if and only if $n = 3$ Motivated by [3, 4], in this paper we study the structure of Frobenius Q1-group. Already, the classification of Frobenius Q-groups has been performed [1].

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