ON YOSHIDA'S TRANSFER

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1. Introduction

An important new work on transfer has recently been done by Yoshida [3]. The author discussed some of Yoshida's main results together with some applications of them at the Duluth Conference (Duluth, Minn., Aug., 1976). This paper is based on the lecture given by him at the conference.

In his paper [3], Yoshida introduced the following important notion.

DEFINITION. Let p be a prime. Let G be a finite group, H a subgroup, K a normal subgroup of H and let x be an element of G. The quadruple (G, H, K, x) is said to be *singular* if the following conditions hold:

(a) $|H:K|=p$,

(b) x is a p-element,

(c) if V is the transfer from G to H, then $V(x)\not\equiv 1$, mod K, and

(d) no element of $H-K$ is conjugate in G to an element of $\langle x^p\rangle$.

Moreover, if $G\neq H$, then the quadruple (G, H, K, x) is said to be *a proper singularity*. H is called *a singular subgroup* of G and x *a singular element*.[1]

One of the main results due to Yoshida is:

Theorem. *If a p-group P has a proper singularity, then P is homomorphic to the wreathed product $Z_p \wr Z_p$.*

The main result of this paper (Theorem 9) is to classify all quadruples (P, S, M, x) with P a 2-group and $|P:S|\geq 4$. We end the paper with an application of Theorem 9 to a very special case.

Yoshida first introduced his transfer argument by using character theory. M. Isaac, however, has observed that one could obtain most of Yoshida's main theorems without character theory. Some of the proofs of Yoshida's theorems quoted in this paper are based on his note (unpublished) circulated at the Duluth Conference.

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1) Setting (a′) H/K *is cyclic p-group*, Yoshida calls a quadruple (G,H,K,x) a weak singularity if it satisfies (a)′, (b), (c) and (d).