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QUASI-PROJECTIVE BRAUER CHARACTERS

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Dedicated to Professor B. Huppert on the occasion of his 90th birthday.

Abstract We study p -Brauer characters of a finite group G which are restrictions of generalized characters vanishing on p -singular elements for a fixed prime p dividing the order of G . Such Brauer characters are called quasi-projective. We show that for each irreducible Brauer character φ there exists a minimal p -power, say $p^{a(\varphi)}$, such that $p^{a(\varphi)}\varphi$ is quasi-projective. The exponent $a(\varphi)$ only depends on the Cartan matrix of the block to which φ belongs. Moreover $p^{a(\varphi)}$ is bounded by the vertex of the module affording φ , and equality holds in case that G is p -solvable. We give some evidence for the conjecture that $a(\varphi) = 0$ occurs if and only if φ belongs to a block of defect 0. Finally, we study indecomposable quasi-projective Brauer characters of a block B . This set is finite and corresponds to a minimal Hilbert basis of the rational cone defined by the Cartan matrix of B .

Keywords: block, defect, Cartan matrix, Brauer character, quasi-projective character, projective module

MSC2010: 20C20

1. INTRODUCTION

Throughout this paper let p always denote a prime and let G be a finite group. By $\text{Irr}(G)$ resp. $\text{Irr}(B)$ we denote the set of ordinary irreducible characters of G resp. of a p -block B , and by $\text{IBr}_p(G)$ resp. $\text{IBr}_p(B)$ that of irreducible p -Brauer characters with respect to a p -modular splitting system. We put $l(B) = |\text{IBr}_p(B)|$. Finally, we write Φ_φ for the ordinary character associated to the projective cover of the module affording $\varphi \in \text{IBr}_p(G)$. If χ is a generalized ordinary character of G , then χ° denotes

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