

# INTRODUCTION

Many authors and researchers studied the representation and character theory say Zassenhaus. In 1958, studied theory of groups, Swan. In 1960, studied induced representations and projective modules, Curtis and Rainer. In 1962, presented the representation theory of finite groups and associative algebras, Scott. In 1964, gave group theory, Burrow. In 1965, gave representation theory of finite group, Feit. In 1967, studied characters of finite groups, Yuen Lam. In 1968, gave some Artin exponent of finite groups, Keown. In 1976, presented an introduction to group representation Theory, Isaacs. In 1976, discussed character theory of finite group, Lederman. In 1977, studied introduction to group characters, Rotman. In 1988, gave an introduction to the theory of groups, Behraves. In 1998, presented the rational character table of special linear groups, Behraves. In 1999, presented quasi-permutation representation of  $SL(n, q)$  and  $PSL(n, q)$ , Games and Liebeck. In 2001, discussed Representation and Characters of Groups, Gehles. In 2002, studied ordinary character of finite special linear groups, Jackson. In 2004, gave some notes on the representation theory of finite groups, Dunya Mohammed. In 2006, studied on the rational valued characters of the special linear groups  $SL(2, 2^k)$ , Dalia Rafat. In 2006, studied on rational characters of some linear groups.

Now, for a finite group  $G$ , we denoted the Artin exponent of a group  $G$  by  $A(G)$ . In this work the group  $G$  under considerate is  $SL(n, p^k)$  which is a special linear group, where the variables are fixed to  $n=2, k=1$  and  $p$  be any prime number such that:  $p \geq 5$ .

The problem of finding the  $A(SL(n, p^k))$  seems to be unattached. We have found in this work that

$$A(SL(n, p^k)) = p - 1.$$

The work is presented by three chapters:

**Chapter One:** we describe and illustrate a number of definitions and basic examples (section 1.2). The notion of a finite group is considered in detail in (section 1.3). Again the importance is attached to the description of examples to illustrate these concepts, we used that for constructing the character table of  $SL(n, p^k)$  where  $p$  is a prime and  $p \geq 5$ , in chapter 3. In (section 1.4) we develop the theory necessary to understand the contents of a character table. In (section 1.5) we introduce some important definition of the abelian group and describe the character table of this group.

**Chapter Two:** we describe and illustrate by a number of definitions and basic examples (section 2.2) we introduce some important definitions of the restricted and induced character. In (section 2.3) we set up the basic definitions for Artin character, Artin exponent and table of Artin character.

**Chapter Three:** This chapter is devoted to some members and important classes of groups i.e the special linear groups. After describing important features of this group and investigating their conjugacy classes (section 3.2) One can move on to constructing the character table of  $SL(n, p^k)$  where  $p \geq 5$ . great care is taken to illustrate each step and a number of additional calculation (section 3.3). In this section we study, the method to find the Artin exponent of the finite special linear group  $SL(n, p^k)$ , if  $n = 2$ ,  $k = 1$ , and  $p$  are any prime numbers such that:  $p \geq 5$ . And how to find the character table of this group is also presented in this section.