

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

CHARACTER TABLE OF SYMMETRIC
GROUP S_3 USING PERMUTATION MODULE

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

The aim of this project is to describe the conjugacy classes and the irreducible representation of finite group together with character table of symmetric group (S_n). The irreducible character of symmetric group (S_n) was determined by using permutation module and the representation of Young tableaux is used to obtain an irreducible representations. A character table of S_n are constructed in this project is for symmetric group of order 3. Hence, the partition of S_3 was generated in order to determine the conjugacy classes as well as the cycle shape of the partitions. Permutation module, M^λ was used to find the character entries in character table of S_3 . However, this method does not produce irreducible characters, then the method of permutation matrix together with the definition of Fixed Point formula was applied to find the irreducible characters in character table S_3 . Finally, the conjugacy classes and irreducible characters of S_3 is obtained in order to construct character table of S_3 .

1 INTRODUCTION

1.1 Research Background

Neumann (2010) found that the term 'group' was developed by Evariste Galois. He establish a connection known as Galois theory between the field theory and group theory development. Besides, he was the first to use groups to discover the solvability of polynomial equations in which polynomial are best understood by analysing certain groups of permutation of their roots. Since then, group have risen in almost every branch of Mathematics. By the end of the nineteenth century, there were two main series of group theory which are topological groups (Lie group) and finite groups. In this century, infinite groups has joined the two existing series. Then, Arthur Cayley and Augustin Louis pushed the investigations of solvability of polynomial equations by creating the theory of permutation groups. Early results about permutation groups were obtained by Lagrange, Ruffini and Abel in their quest for general solutions of polynomial equations of high degree. However, their works was somewhat isolated. In 1830, Galois found group theory and used it to solve one of the outstanding problems of his day, which was to find analogous formulas for the roots of polynomials of higher degree. Klein introduced symmetry group in Erlangen program. In 1884, the introduction of Lie groups has started with Sophus Lie followed by the work of Killing, Study, Schur, Mauler and Cartan.

In the end of 19th century, Burnside, Frobenius, Brauer and Schur have contributed largely in developing the theories of representations and characters of finite groups. In 1897, there exists two significant mathematical events which are the publication of the first paper on representations of finite groups by Ferdinand George Frobenius (1849-1917) and the appearance of the first treatise in English on the theory of finite groups by William Burnside (1852-1927). Then, Burnside developed his own approach on representations of finite groups. In the next few years, Frobenius and Burnside have investigated the new subject and its implementations to finite group theory. They were soon joined in this enterprise by Issai Schur (1875-1941) and