



**STRESS ANALYSIS OF THE PISTON DUE TO PRESSURE USING FINITE
ELEMENT ANALYSIS (FEA) SOFTWARE**

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ABSTRACT

This final project is a study about the stress analysis of the piston due to the pressure. This research consist of the first law analysis of engine cycle, heat engine process, stress analysis, study the software for simulation purpose, simulation of the piston model and finally get the results from the simulation. The Finite Element Analysis (FEA) Nastran software is used to simulate the stress on entire of the piston model in the internal combustion chamber. From the results of the simulation, the stress distribution and the critical area was acting on the piston model when the pressure was applied to the piston was studied. The model of the piston is constructing in the CATIA V5 software and then the simulation was done in Finite Element Analysis (FEA) Nastran software. This research is making a comparison the stress distribution between aluminium and cast iron where the result showed the piston from cast iron can withstand the high stress compare to the aluminium. All of the description and result of the research are included in this thesis. It is hoped that this research can produce some relevant basic information and benefit to any parties who would like to further it.

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CHAPTER I

PRELIMINARY WORKS

1.0 Introduction

The *internal combustion* (IC) engine is a heat engine that converts chemical energy in a fuel into mechanical energy. Chemical of the fuel is first converted to thermal energy by means of combustion or oxidation with air inside the engine. This thermal energy raises the temperature and pressure of the gases within the engine and the high-pressure gas then expands against the mechanical mechanisms of the engine. The main function of an internal combustion engine in a system is to provide useable power output.

Internal combustion engines can be classified into *spark ignition* (SI) engine and *compression ignition* (CI) engine. A SI engine starts the combustion process in each cycle by use of a spark plug. The spark plug gives a high-voltage electrical discharge between two electrodes, which ignites the air-fuel mixture in the combustion chamber. The combustion process in a CI engine starts when the air-fuel mixture self-ignites due to high temperature in the combustion chamber caused by high compression.

There were also two types of engine cycle that is the four-stroke cycle and the two-stroke cycle. A four-stroke cycle experiences four piston movements over two engine revolutions (720°) for each cycle, which include the intake stroke,