CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter provides the overview of the strain and the vibration signals. The background of the research be described and followed by the problem statement. This followed by the objective and scope of the study which perform the fatigue life analysis by the laboratory testing to collect strain and vibration signals.

1.2 STRAIN AND VIBRATION SIGNAL

The response of a system to an applied stress is called strain. The stress produces by the loaded force on a material caused the material to deform and the amount of the deformation in the direction of the applied force divided by the initial length of the material is called engineering strain. The measure of the amount of strain being endured by a material is necessary in the various fields of engineering and applied science. This is because, from the measurement, the modulus of
elasticity and Poisson’s ratio can be determined for a specific material then the properties are used to design an infinite number of highly stress and the critical component.

The study of motion of masses about its equilibrium position is called vibration. Strain oscillates within the elastic components due to vibration motion which results in fatigue stresses. The natural frequencies, corresponding mode shapes and damping are the three parameters that defined the dynamic characteristics of the vibration system. These three parameters will show the dynamic characteristics of the system and they are used in vibrational analysis.

1.3 RESEARCH BACKGROUND

Researchers believe that during the component or structure subjected to the loading, there were existences of strain and vibration signals on the same time which will contribute to mechanical failure of the component. The mechanical failure of the component will effect the safety and also the environment because it may cause big destruction of structure such as bridge, vehicle etc. Hence, strain and vibration signals are really necessary for this study in order to find the correlation between them which induced mechanical failure.

The strain and vibration signals measured on a beam were used as the subject for the study as the component directly experienced the load when the system is running. Statistical analysis is use for the analysis of this research.
1.4 PROBLEM STATEMENT

In various engineering field, it is very important to study about fatigue life and the vibration of the mechanical component because both of them relate to the mechanical failure of the component or structure. Fatigue failure is related to the strain applied on the component. From the previous researcher, they believe that mechanical failure of a beam caused by the fatigue failure. It has been estimated that fatigue contributes to approximately 90% of all mechanical service failures (ASM International, 2008). Fatigue failure occurs due to the repetitive cyclic stress that much lower than the stress needed to cause failure during a single application of stress. Other researcher, found that in service life, automotive suspension system experiences the significant load that cause vibration and displacement that contributing to mechanical failure through fatigue (S. Abdullah et al., 2007). Vibration is related to mechanical failure because it induced strain to oscillate then effect the fatigue life of the structure. Therefore, in order to reduce the possibility of the component to fail, it is really important to study the correlation of these two signals.

1.5 OBJECTIVE

The main objective of this study is to find correlation between the strain signals and the vibration signal.

1.6 SCOPE

The main purpose is to perform laboratory testing to collect strain and vibration signals. For this experiment, the software used is Dasylab which performed the both signals using Strain gauge, accelerometer, NI equipment and