INTISARI

Sistem yang digetarkan oleh gaya harmonik eksternal akan bergetar pada frekuensi yang sama dengan frekuensi pemaksa. Ketika frekuensi pemaksa bertepatan dengan frekuensi alami sistem maka akan terjadi fenomena resonansi. Dibuat sistem dua derajat kebebasan sebagai simulator sistem sederhana yang terdiri dari bagian utama, yaitu massa dan pegas.

Pada penelitian ini dibangun simulator untuk memahami lebih detail fenomena osilasi pada sistem dua derajat kebebasan, dengan mengamati grafik osilasi sistem. Dilakukan analisis juga terhadap nilai redaman yang timbul pada sistem yang hanya terdiri dari massa dan pegas. Proses perancangan simulator melalui tiga tahapan, yaitu perancangan konsep, pembuatan desain, dan penyesuaian desain dengan ketersediaan bahan di lapangan. Setelah hasil perancangan didapat, dilakukan proses manufaktur simulator. Sistem yang dibuat memegang prinsip *two degree of freedom system with force vibration*, dengan memanfaatkan massa dari benda statis dan gaya dari *speaker* sebagai eksitasi getaran. Data getaran sistem dicatat menggunakan *accelerometer*.

Berhasil dibuat simulator sistem dua derajat kebebasan dengan *Vibration Exciter* berbasis *speaker*. Kemudian dilakukan perbandingan data dari hasil pengujian sistem yang menunjukkan bahwa nilai frekuensi alami hasil pengujian cenderung lebih kecil dari frekuensi alami teoritis. Selain itu juga dilakukan perbandingan nilai *amplitude ratio* teoritis dan hasil pengujian, dan didapat nilai *amplitude ratio* hasil pengujian cenderung lebih kecil dari nilai teoritis. Hal ini diakibatkan pengaruh *damping* yang timbul akibat gesekan pada komponen simulator sistem dua derajat kebebasan. Dilakukan pengujian mengenai input dain amplifier dan didapat meningkatnya parameter *volume level* pada sistem amplifier membuat nilai amplitudo massa 1 dan massa 2 meningkat signifikan dengan *trend* peningkatan *linear*.

Kata kunci: frekuensi alami, dua derajat kebebasan, *experimental modal analysis*, getaran paksa, *mass-spring system*.

ABSTRACT

A system that is vibrated by an external harmonic force will vibrate at the same frequency as the forcing frequency. When the forcing frequency coincides with the natural frequency of the system, a resonance phenomenon occurs. A system with two degrees of freedom was built as a simple system simulator consisting of the main parts, namely the mass and the spring.

In this study, a simulator was built to understand in more detail the oscillation phenomenon in a two-degree-of-freedom system, by observing the oscillation graph of the system. An analysis is also made of the damping value that arises in a system that only consists of mass and springs. The simulator design process goes through three stages, namely concept design, design making, and design adjustments with the availability of materials in the field. After the design results are obtained, the simulator manufacturing process is carried out. The system made holds the principle of a two degree of freedom system with forced vibration, by utilizing the mass of static objects and the force of the speaker as vibration excitation. System vibration data is recorded using the accelerometer.

A two-degree of freedom system simulator has been successfully built with a speaker-based Vibration Exciter. Then a comparison of the data from the system test results is carried out which shows that the natural frequency value of the test results tends to be smaller than the theoretical natural frequency. In addition, a comparison of the theoretical amplitude ratio value and the test results was also carried out, and the amplitude ratio value obtained from the test results tended to be smaller than the theoretical value. This is due to the damping effect that arises due to friction on the simulator component of the two degrees of freedom system. Tested on the input and amplifier and it was found that increasing the volume level parameter in the amplifier system made the amplitude values of mass 1 and mass 2 increase significantly with a linear increasing trend.

Keywords: natural frequency, two degrees of freedom, experimental modal analysis, forced vibration, mass-spring system.