PROJECT REPORT ON

Structural Analysis of an Off-Road Vehicle Suspension System Using CATIA and ANSYS

A project report submitted in partial fulfillment of the requirements for the award of the

Degree of

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

SUBMITTED BY

S. SIDDHU	(21815A0362)
R. MEGHANA	(21815A0361)
R. ASHOK	(21815A0356)
S. RATHI DEVI	(21815A0340)
B. MAHESWARI	(21815A0339)

Under the esteemed guidance of

Mrs. K. SANDHYA M.Tech

Assistant Professor

DEPARTMENT OF MECHANICAL ENGINEERING

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(PERMENANTLY AFFLIATED TO JNTU-GURAJADA VIZIANAGARAM,

ACCREDITED BY NAAC A+, APPROVED BY AICTE, RECOGNISED BY UGC 12f & 2b)

TAMARAM, MAKAVARAPALEM, ANAKAPALLI DIST-531113

2020-2024

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(APPROVED BY A.I.C.I.T.E AFFILIATED TO JNTU-GV, NAAC ACCREDITED INSTITUTION)

TAMARAM, MAKAVARAPALLEM, ANAKAPALLI -531113

DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that the project work entitled–STRUCTURAL ANALYSIS OF AN OFF-ROAD VEHICLE SUSPENSION SYSTEM USING CATIA AND ANSYS submitted by **S.SIDDHU (21815A0362), R.MEGHANA (21815A0361), R.ASHOK (21815A0356), S.RATHI DEVI (21815A0340), B. MAHESWARI (21815A0339)** to Avanthi Institute of Engineering and Technology, Makavarapalam, Visakhapatnam in partial fulfillment for the award of the degree of Bachelor of Technology in Mechanical Engineering, is a bonafide record work carriedout by them, under guidance and supervision during 2020- 2024.

The results embodied in this project work have not been submitted to any other university or institute for the award of any degree.

24/4/2024

PROJECT GUIDE

Mrs. K. SANDHYA M.Tech

Assistant professor

24/4

HEAD OF THE DEPARTMENT

Dr V. HARI KIRAN Ph.D.

Associate professor

EXTERNAL EXAMINER

ABSTRACT

This project delves into the structural analysis of an off-road vehicle suspension system, employing cutting-edge software tools such as CATIA and ANSYS. Off-road vehicles necessitate robust suspension systems capable of withstanding harsh terrain conditions while ensuring vehicle stability, manoeuvrability, and passenger comfort. The study focuses on evaluating the structural integrity, performance, and behaviour of the suspension system under diverse load conditions and terrain scenarios.

Initially, a detailed 3D model of the suspension system is developed using CATIA V5. This model encompasses critical components including suspension arms, shock absorbers, springs, bushings, and connecting linkages, with precise dimensions, material properties, and assembly configurations incorporated to ensure accuracy. Subsequently, the CAD model is imported into ANSYS, known for its capabilities in simulating structural behaviour and analyzing mechanical systems. Finite element modeling techniques are utilized to discretize the complex geometry of the suspension system into finite elements, enabling the simulation of stress, strain, deformation, and other mechanical responses.

Structural analysis is conducted under various operating conditions, encompassing static loads, dynamic model, and off-road terrain simulations. Static analyses evaluate the suspension system's response to gravitational forces, vehicle weight, and external loads, ensuring compliance with safety and performance standards. Dynamic analyses investigate the system's behaviour model analysis for natural frequency calculation.

Furthermore, off-road terrain simulations are performed to assess the suspension system's performance across diverse terrains, including rocky surfaces, uneven terrain, and obstacles. Factors such as ground clearance, articulation, wheel travel, and impact resistance are analyzed to determine the system's capability to withstand off-road challenges while maintaining vehicle stability and passenger comfort.

The springs are to be designed for higher stresses with small dimensions to have better spring design which leads to save in material and reduction in weight.