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Frame Fabrication of Electric Formula One Car

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Abstract: Design, fabrication, and testing of electric formula one car is presented in this paper. The design guidelines are based on the specifications set by the organizer, universities, design of the car was carried out using SOLID MODELLING system. The car was fabricated in the workshop of mechanical and manufacturing engineering. The car has been tested for its performance.
Keywords: Frame, Fabrication, testing, analysis, conceptual design, actual working.

I. INTRODUCTION

The product design and fabrication are the good activity carried out by the students. We have use various components whichsupports the electric formula one car each components have its own specifications.

1) Acceleration was directly dependent on the mass of the vehicle, the chassis comprises most of the weight of the vehicle, and hence the chassis should be light in weight.
2) Rigidity was important to maintain precise control over the suspension geometry. To keep all four of the wheels firmly in contact with the ground.
3) Safety of the driver was also the main criteria for designing, using Finite Element Method (FEA) analysis the designedframe was validated to ensure the best possible geometry for safety and performance.
4) In various research papers, dynamic frequency Analysis of frame was done which helps in determining the frequency of wave generated in the frame after the impact.
5) Also, the principle of manufacturing frame was using the clamping tools, which are made of wood, was explained insome papers.

II. SPECIFICATIONS AND DESCRIPTION OF THE CAR

For making a car, the following subsystems such as chassis subsystem, front and rear suspensions subsystem, steering subsystem, wheel and tyre subsystem, brake subsystem should be designed and fabricated. The main aim of the project was to make a safe chassis which can be used to support various components like batteries, suspension, wheels, etc. to make up complete formula one student car which can be used for racing competition.

The various material available in the market can be optimized to choose the one which suits our purpose for the race vehicle and was not much costly so as a financial burden to a team member. From paper, we know that the design process of any roadworthy vehicle begin with the tyres are the only point of contact between the vehicle and the road. They also suggested that while selecting the materials for motorsports application the most common factor consider as strength, cost, and weight to design competitive vehicle, it must be light and yet strong.

III. MATERIAL SELECTION

The material with low cost, high strength and good weld ability must be used for frame. After extensive paper study of different material and after doing market survey, we concluded the decide between SAE and Mild steel (MS) pipes. Alter discussion and after lots of research and analysis, acknowledging the physical strength, weight, availability of material and most important the cost of the material, we decided to use as ‘Mild Steel’ for frame.

The material is considered depending upon various factors such as maximum load capacity, force absorption capacity, strength, and rigidity.

For our project, we made use of 3 x 1-inch rectangular pipes for the sections of frame which are going to bear most of load (i.e. base of frame and main body) and 1 x 1 inch square pipes for remaining section of frame (i.e. supports and outer parts) as shown in photographs.

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A. Features of MS Pipes

1) High strength.
2) High resistance to pitting, corrosion resistance.
3) High resistance to erosion, stress corrosion cracking and corrosion fatigue.
4) Good weld ability and workability.
5) High energy absorption, dimensional accuracy, durable.

IV. PHOTOGRAPHS

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V. CONCLUSION

In conclusion, from the literature survey and methodology, we find that the frame and chassis stiffness significantly affect vehicle behavior and handling. As the frame chassis gets less stiff the vehicle behaves in an increasingly undesirable manner to driver inputs and becomes increasingly hard to drive. Through the analysis of these trends, with manufacturing error is considered, we can conclude that future design developments should be made to increase the stiffness of the overall chassis. Not only stiffness and torsional rigidity was important, but clearance and compliance stacking were also a phenomenon which affects the frame or chassis as well. The suspension point design was also an important factor which shpuld be considered.

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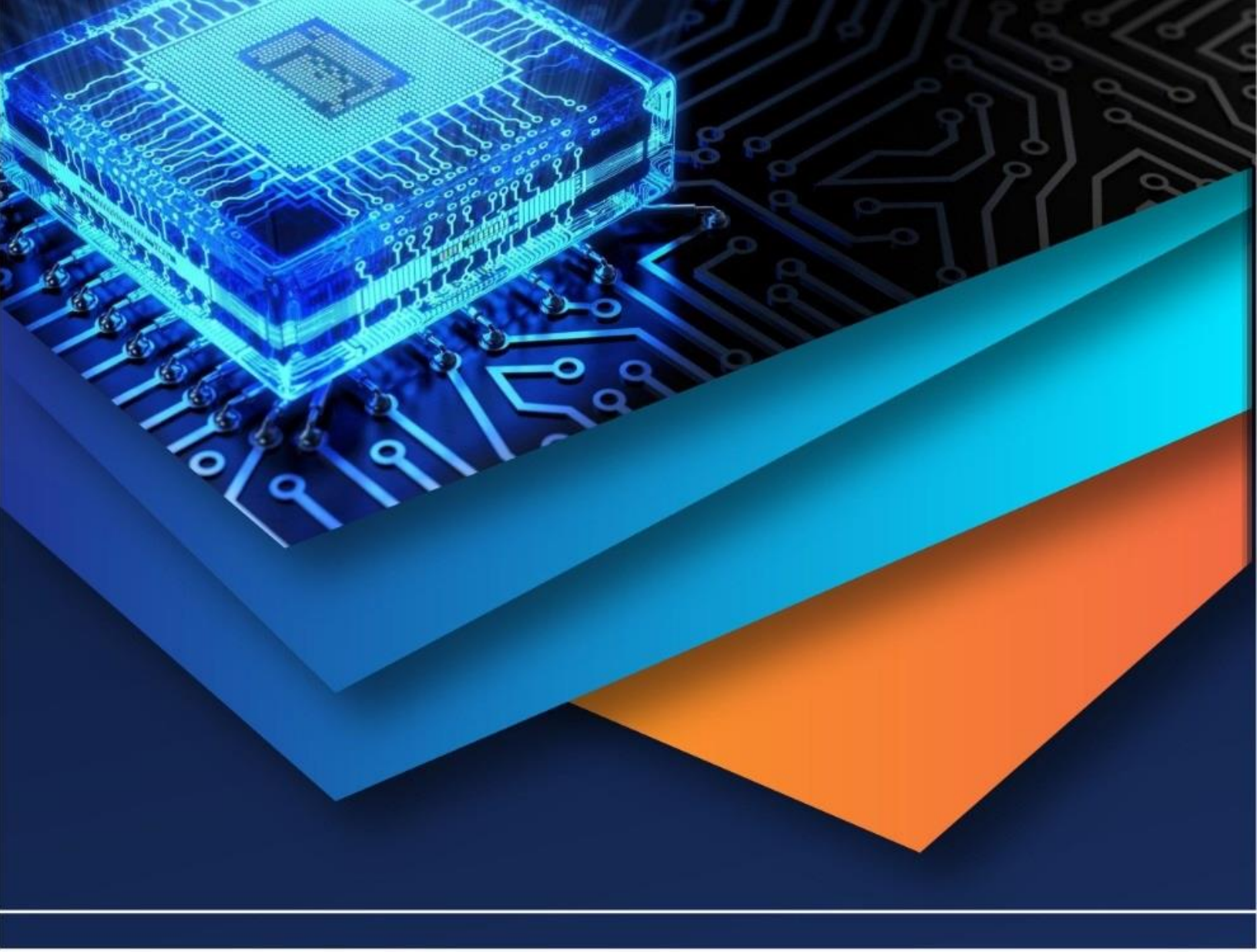

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