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Design, Modelling and Development of a Go-Kart Vehicle

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Abstract **- A go kart is a small four wheeled open vehicle basically used for racing and amusement purpose. We have designed and fabricated a go kart for our Annual Event, the Gyan Expo. Mostly, making a new go kart costs around one lakh and many are trying to build it under one lakh. We have made our go-kart under 35,000 rupees. We had totally made it from the scrap. This report explains objectives, assumptions and calculations made in designing a Go-Kart. The design in chosen such that the Kart is light, safe to drive, easy to fabricate. The other objective is to make a kart with driver comfort to increase the performance and maneuverability of the vehicle.**

INTRODUCTION

Go-Kart is a simple four-wheeled, small engine, single seated racing car used mainly in United States. They were initially created in the 1950s, Post-war period by airmen as a way to pass spare time. A Go-Kart, by definition, has no suspension and no differential. They are usually raced on scaled down tracks, but are sometimes driven as entertainment or as a hobby by non-professionals. Karting is considered as the first step in any serious racer's career. We approached our design by considering all possible alternatives for a system, the model was modified and retested and a final design was fixed. The design process of the vehicle is based on various engineering aspects depending upon safety and ergonomics, market availability, cost of the components and safe engineering practices.

SCOPE OF PROJECT

This project was mainly made for the purpose of our school exhibition (Gyan Expo) for demonstrating knowledge of Engineering Physics. So we are just making it for the purpose of driving it to short distances and not for racing. The craze for go kart is too much in American and European countries. Slowly its vogue is seen in India too. We have made our go kart simply with scrap materials so it cost us less as compared to the go karts made from kits, etc. The most important thing to keep in mind is that the kart should be strong as well as light in weight.

MATERIAL SELECTION

For the frame we have chosen mild steel as it is light weight and strong easily available in our town. It is also low cost and reasonably soft and ductile. It is easily cut and machined. It is used in ship hulls, garden gated, girders, general structural steel, etc.

MILD STEEL PROPERTIES

Ultimate tensile strength	**841 MPa**
Yield tensile strength	**247 MPa**
Density	**7.87 g/cc**
Elongation of break (in 50m)	**15.0%**
Bulk modulas	**140 GPa**
Poissons ratio	**0.290**
Shear modulas	**80.0 GPa**

We have used thin ply wood for making our base floor to cut cost and save our time.

FORMATION AND DESIGN OF PARTS

CHASSIS – It refers to the frame of the go kart. By keeping in mind that the go kart should be light weight we have choose mild steel of particularly 1inch diameter& 1.5 mm thickness. Mild steel is a type of carbon steel with low carbon content. It is known as mild steel because of its relatively low carbon content. It is also known as low carbon steel .We have designed the chassis of 20 kg.

Modelling of chassis-

This chassis has been made while keeping in mind that it meets the driver confront and could give as safe drive.

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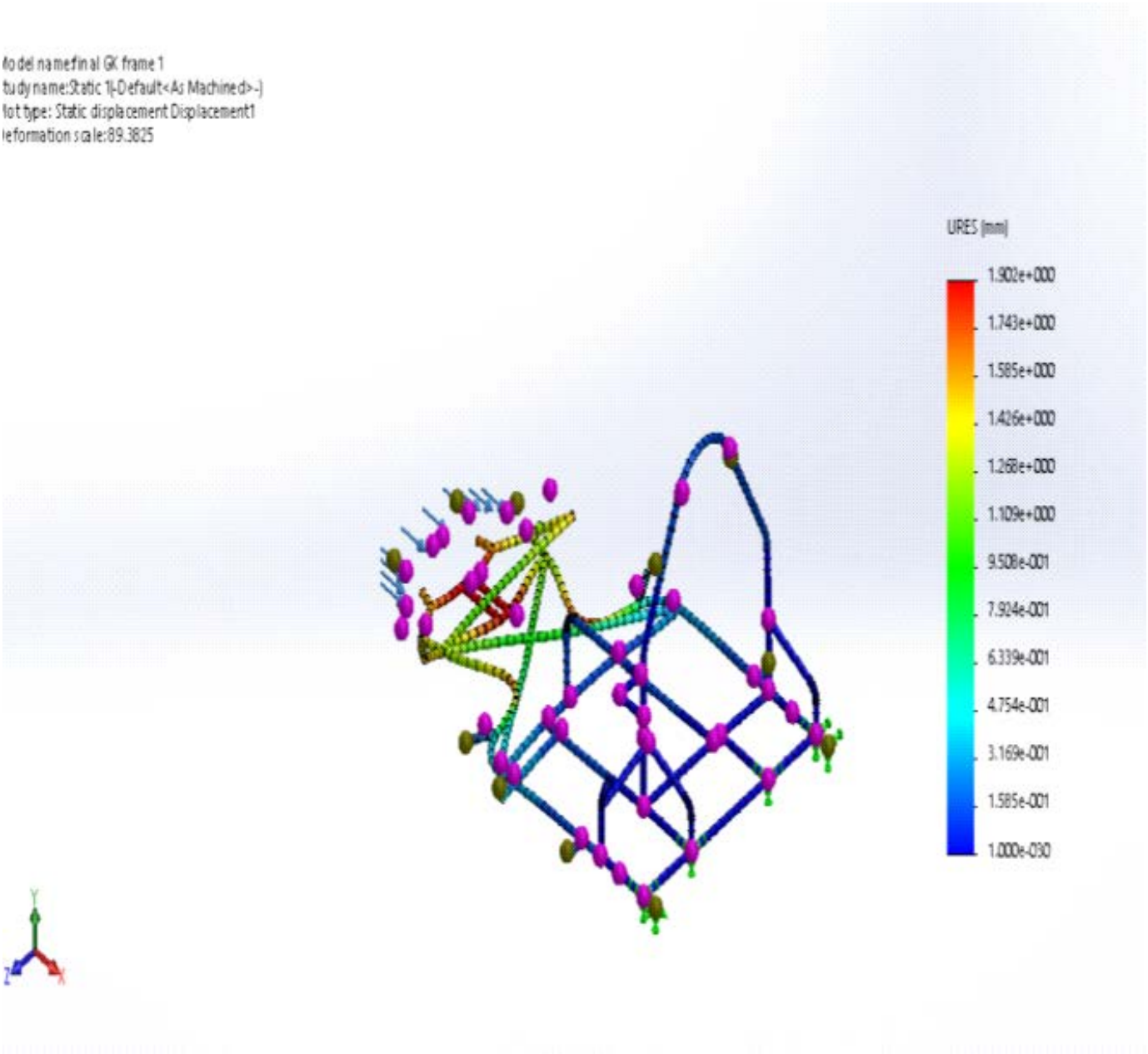
VERTICAL LOADING
Front impact
FOS=1.4

F=6000N
Deformation=4.6mm



Side Impact
F=3000N
Deformation=4.6mm

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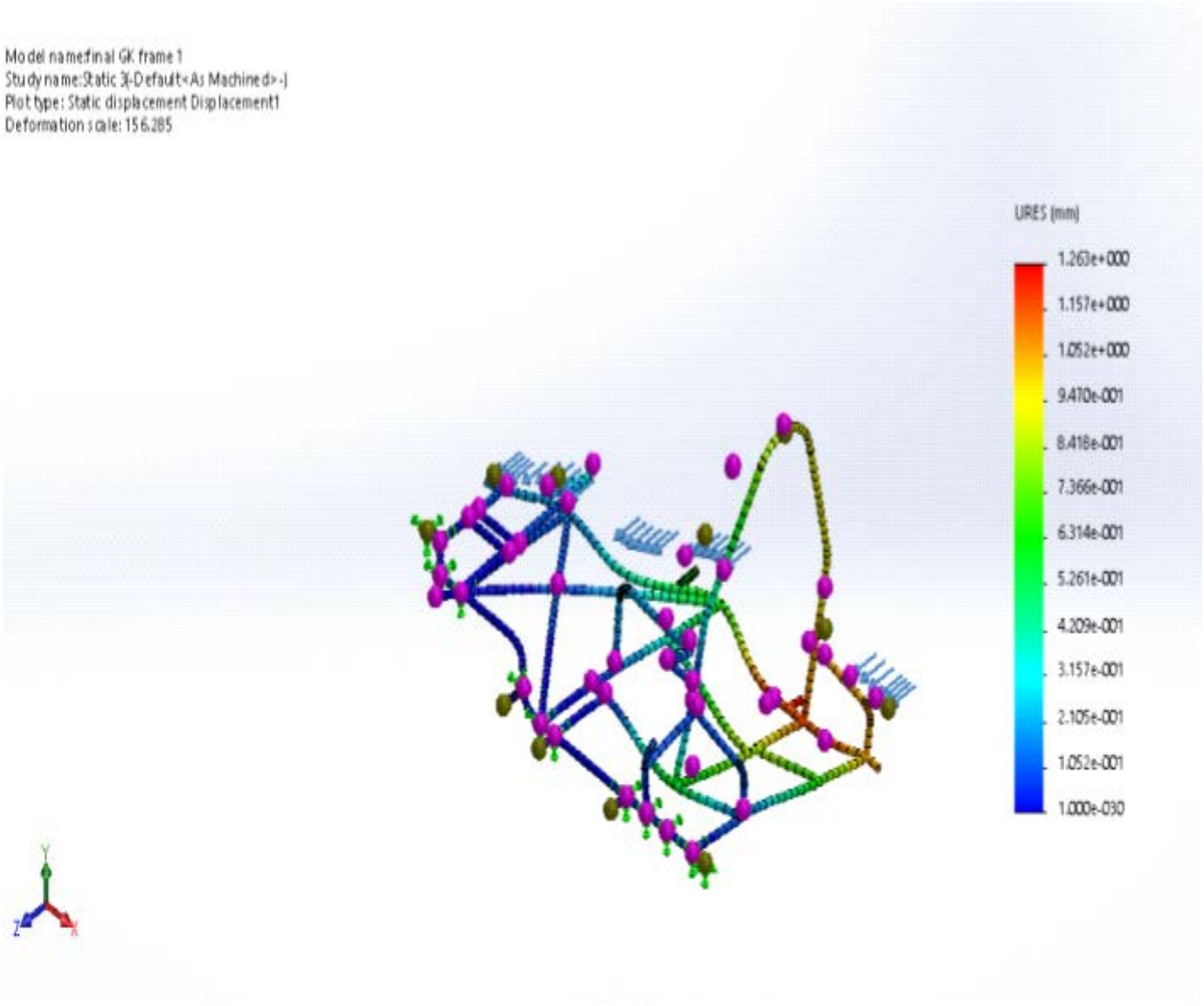

Rear impact
F=3000N
FOS=4.3
Deformation=4.6mm

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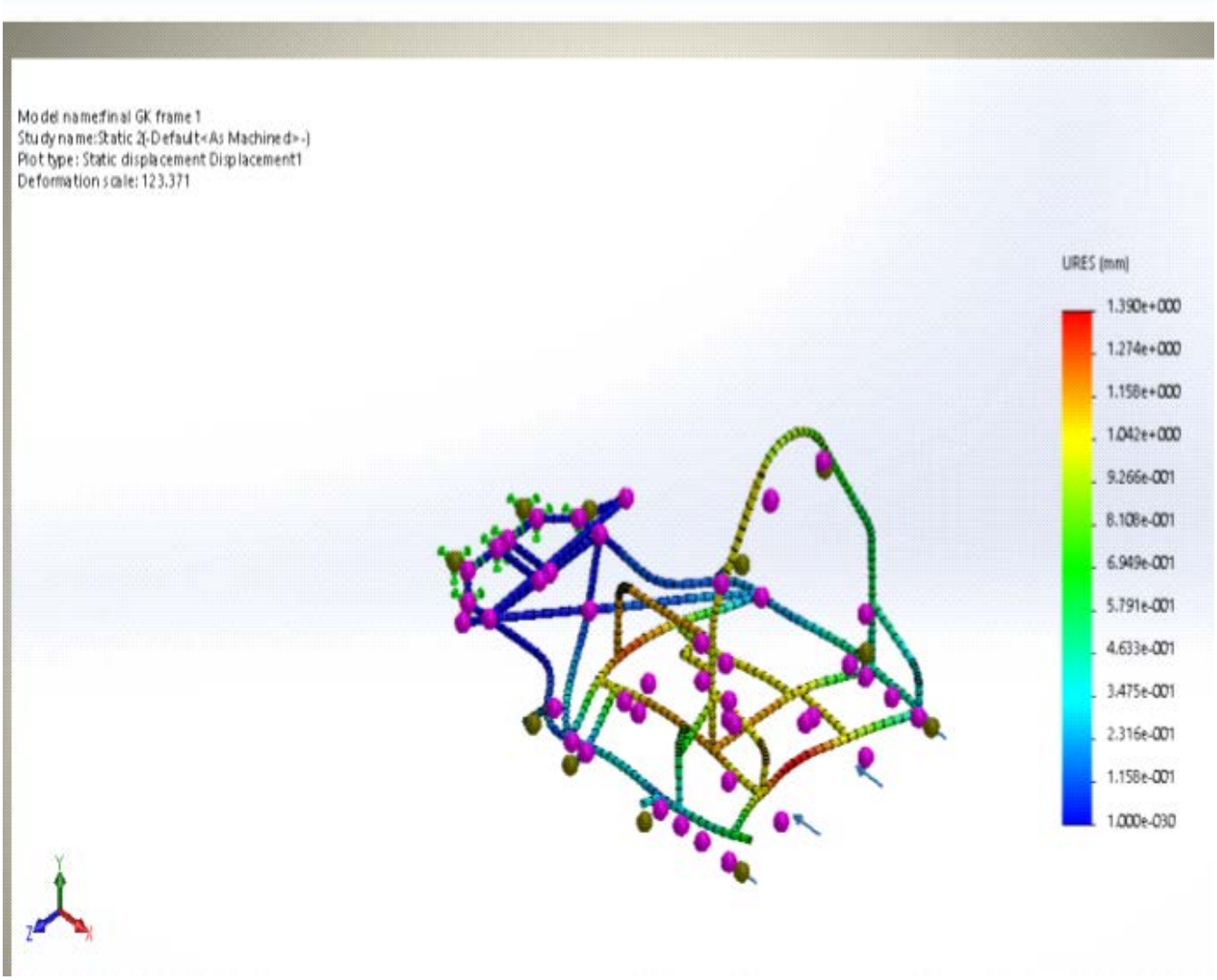

ENGINE AND TRANSMISSION

We have used TVS Scooty Pep CVT engine of 100cc to reduce the total cost.

PROPERTIES OF ENGINE

Engine type	4 stroke single cylinder forced air cooled
Displacement	100cc
Maximum power	5ps@65rpm
Maximum torque	5.8Nm@4000rpm
No. of cylinder	1
Starting	Battery
Fuel supply	Carburettor
Transmission	Automatic
Drive type	Belt drive

BRAKING SYSTEM

We have choose to use disc brake for our kart.

Position of the brake is on the rear axle at almost centre to balance the Kart when Braking.

Disc brake system consist of a rotor, brake pad, pistons and caliper. Rotor is a circular disc bolted to the wheel hub and spins with the wheel. Brake pads pushes into rotor and creates a friction which slows down or stop the kart. Piston moves the rotor when the driver presses the brake pedals. Piston are cylindrical in shape. Caliper are of two types floating caliper or fixed caliper. We have used floating caliper as it is adequate for everyday driving. When the driver applies the brake, the piston press the brake pads on one side into the rotor, causing the caliper to slide over so the pads on the side of the caliper which doesn't have

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piston also contact the rotor. The brakes should work instantly.

PAINT

We have used spray paint for painting your go kart. As it gets dry soon as compared to any other paint type and also gives a good look to kart. We have painted black colour to the chassis.

DESIGNING ASPECTS DIFFERENT FROM OTHERS:

As we had to drive it on our ground, we needed more ground clearance. Hence our axle was placed below the chassis and not above.

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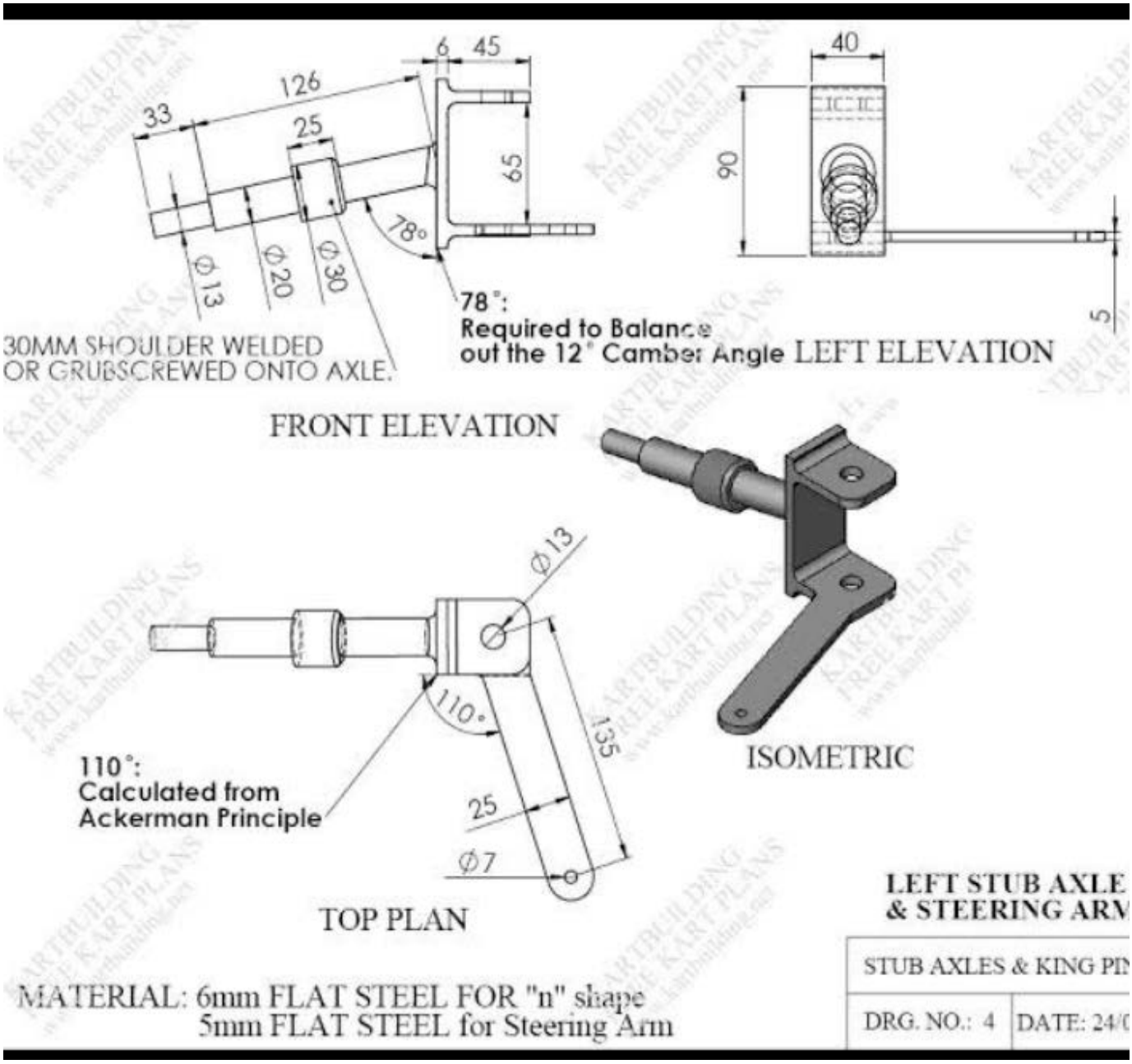

- Tyres selected were of Honda Activa as our engine had barely 100 cc and cost cutting was a must to fit budget. Tyres had disc and no drum brake assembly.
- So our tyres did not have any hub. We took an 8mm MS disc tightly fitted by using Lathe machine. Then we made a bushing of 8 inches length and internal diameter of just fitting our rear axle bolted, grooved and welded to our rear axle. This is how our hub & rear axle fixture got the shape.
- For front tyre hub we did similar thing but bushing was 6 inches in length machined on lathe of internal diameter same as that of the bearing of 20 mm which was then fastened to the stub passing through the hub.
- For Steering system we applied Ackerman Geometry. The tie rods were of uneven lengths as steering wheel was on left side of the chassis. Kingpin Assembly was again as per Ackerman Geometry.
- For Kingpin Assembly we used a Gudgeon pin of piston 15mm internal diameter. As material is not good for fabrication we again made a bushing for it of same length machined and fitted on lathe. Then the Stub axle and stub axle jig both were welded onto the bushing at angles calculated using Ackerman Geometry. Then Kingpin with cotter was fitted in the Gudgeon pin. Gudgeon Pin was selected as it will provide very smooth movement as the kingpin slides within it. This was the most complex part for us.
- We gave Kingpin Inclination of 10 degrees and caster of 13 degrees and Neutral Camber.

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- The Driver seat was towards the left whereas engine towards the right almost near the CG to maintain the balance.
- Some Parameters: Rear Track Width: 62 inches; Front track Width: 54 inches; Wheel Base: 64 inches.

FROM SCRAP :-

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TO DREAMS:-

CONCLUSION

Finally after arranging and setting up all the system we completed making our go kart project. It's the first time that a go kart has been made from just waste material i.e scrap. That also with just a small budget of less than 35,000 rupees only. Our go kart is a type of best out of waste as we had turned the scrap into our dreams i.e go kart. We made this project in just record 9 days.

Watch our journey of making our go kart on youtube:-
https://youtu.be/NTWdDD4xWKk

REFERENCES-

https://www.google.com/
https://www.youtube.com/

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