ES101

Double Wishbone Suspension System

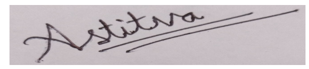
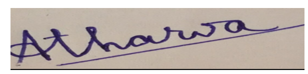
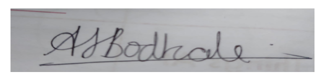
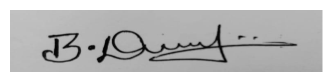
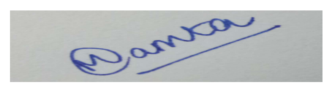
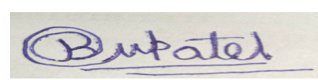
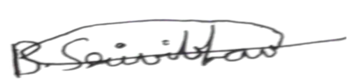
Project Sketches

Double Wishbone Car Suspension System

Team: JASSBA

Group 5

Submission date: 8th June 2023

S.No.	Student Name	Signature
1	Astitva Aryan	
2	Atharva Sachin Dapse	
3	Atharva Santosh Bodhale	
4	Banavath Diraj Naik	
5	Bhambhani Mamta Nareshbhai	
6	Bhateriya Jay Kirtikumar	
7	Bhavik Vijay Patel	
8	Bhosale Shivrajsinh Sandip	
9	Bhoumik Patidar	
10	Birudugadda Srivibhav	

Modifications

We have made changes in the following aspects-

1. Modifications in terms of increased complexity-

   (a) Further study and analysis of the shock strut and shock body led to their division into 2 and 4 subparts, respectively.

   Shock Strut - Shock Shaft, Spring Cup, Ball End, and Piston

   Shock Body - Main Body, Shock Cartridge

   (b) Through further research and study, the following subparts also have been identified in Front Axle System: Hex Drive, Front Hub Bearing, Rear Hub Bearing, and Front Axle.

Breaking down these complex parts into sub-components allows for a more detailed and comprehensive understanding of the system's functionality and design.

2. Modifications in specific parts for improved design-

   Arc Configuration of wheel: The original design called for three equally spaced arcs on the wheel, but we have increased it to five arcs with a gap of 27 degrees between each arc. This modification aims to enhance the load distribution and strength of the wheel. By incorporating additional arcs, we can effectively distribute the load and stress across a larger surface area, minimising the risk of failure and improving the overall structural integrity of the wheel.

3. Dimensions: The majority of the technical documentation and models of the shock absorber on the internet have dimensions in inches. Hence we chose to go ahead with having dimensions in inches only. This is to ensure ease of understanding and improved compatibility.

Dimensioned Sketches

Birudugadda Srivibhav (22110050)

Front Lower Arm

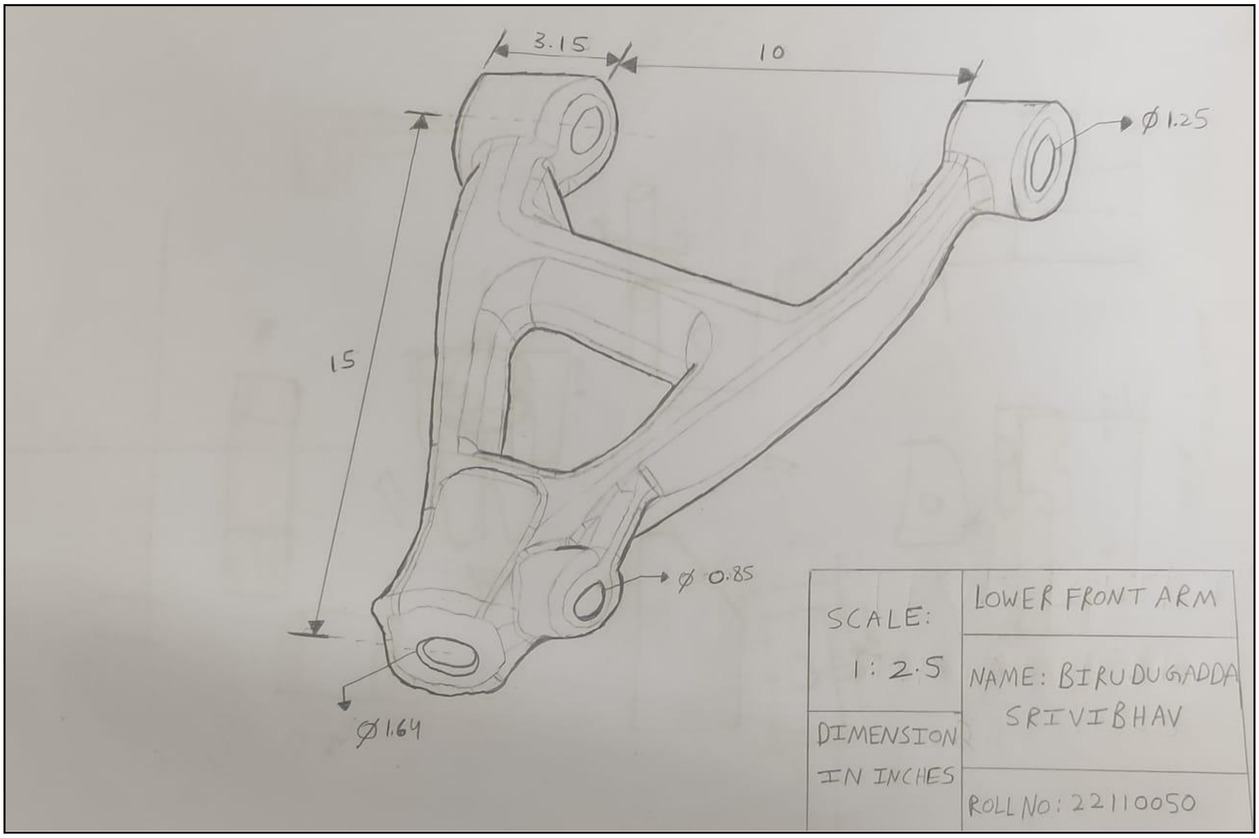


Fig: 3d view of the front lower with dimension drawn by Birudugadda Srivibhav

Reason for selected dimensions

A requirement for the front lower arm in a double wishbone car suspension is that it provides structural support and helps control the vertical movement of the wheel. In our model, the front lower arm is typically located between the chassis and the lower ball joint, connecting the lower part of the wheel hub assembly to the vehicle's frame. To connect the lower front arm with the wheel hub, we will be using a pillow ball joint which serves as the pivotal point between the arm and the wheel hub, allowing for rotational movement and transmitting forces between them. To accommodate the pillow ball in the front lower arm, the front end circular hole is given 1.64 inches in diameter. It is also necessary to have a proper fixed distance of 10 inches between the two branches of a lower front arm in a double wishbone car suspension to maintain proper suspension geometry and ensure optimal handling and stability of the vehicle. Also, the front lower arm is connected to the vehicle chassis through bushings. The bushings act as a cushioning and flexible interface between the lower arm and the chassis, allowing for limited rotational movement and absorbing vibrations and road impacts. The bushings help provide a smoother ride and isolate the chassis from the suspension components.

Materials

The front lower arm of a double wishbone car suspension is an essential component responsible for supporting the weight of the vehicle, transmitting forces, and controlling the vertical movement of the wheel. Various materials are commonly used in the construction of front lower arms to ensure strength, durability, and weight optimisation.

One commonly used material for the front lower arms is steel. Steel offers excellent strength and rigidity, making it capable of withstanding the forces and stresses encountered during vehicle operation. Steel lower arms are typically made through stamping or forging processes, allowing for precise shaping and forming to meet the desired specifications. The use of steel provides a solid foundation for the suspension system, ensuring stability and control while maintaining the structural integrity of the vehicle.

Another material used in the construction of the front lower arms is aluminium. Aluminum offers advantages in terms of weight reduction. It is significantly lighter than steel, which can contribute to improved fuel efficiency and overall vehicle performance. Aluminum lower arms are often manufactured using casting or forging techniques, enabling complex shapes and designs. The use of aluminium can help reduce unsprung weight, enhancing suspension response and improving handling characteristics.

In some cases, the front lower arms may incorporate composite materials. Composites, such as carbon fibre-reinforced polymers (CFRP), offer high strength-to-weight ratios and excellent resistance to corrosion. These materials can provide significant weight savings while maintaining structural integrity. However, composites tend to be more expensive to manufacture and may require specific manufacturing processes.

Banavath Diraj Naik (22110044)

Front Lower Arm Brace and Shock Brace

1) <u>Front Lower Arm Brace</u>

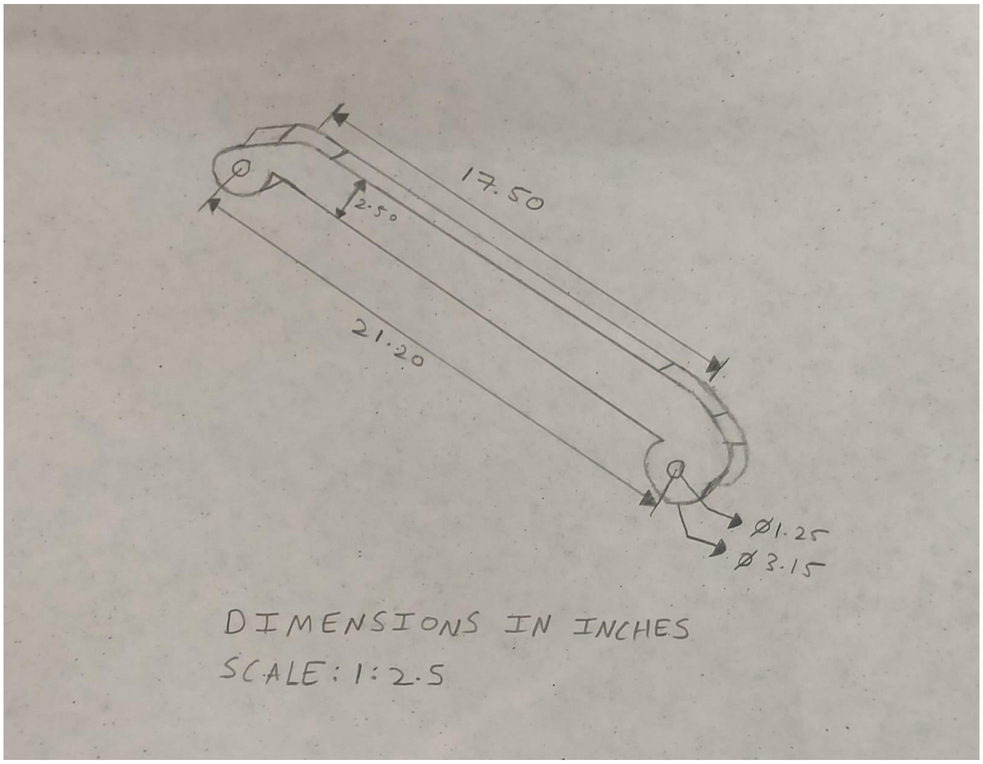


Fig 1: 3d view of the front lower arm brace

Reason for selected dimensions

The front lower arm plays a crucial role in joining the two front lower arms of the double wishbone car suspension. The length of the brace plays a significant role in the efficiency and performance of a car's suspension system. The longer the length of the front lower arm, the stiffer the car suspension. We have chosen to have an optimal length of 21.20 in. When a car turns, weight shifts from one side to the other, causing the body to roll. The brace bar counteracts this roll by transferring force from the loaded side to the unloaded side of the suspension. A longer front arm brace, along with other factors such as bar thickness and material, can reduce body roll and enhance stability.

Materials

Steel is one of the most commonly used materials for brace bars due to its strength and cost-effectiveness. brace bars made of steel can be solid, hollow, or tubular. Solid steel bars are thicker and heavier, providing greater stiffness and resistance to body roll. Hollow or tubular steel bars offer a balance between strength and weight, making them a popular choice for various applications.

Chromoly steel, an alloy of chromium and molybdenum, is used in performance-oriented brace bars. It offers higher strength and lighter weight compared to regular steel. Chromoly steel brace bars are suitable for applications where reducing unsprung weight is desired, as they provide improved performance without sacrificing durability.

some more alternatives include aluminium, carbon fibre etc.

2) <u>Front Shock Brace</u>

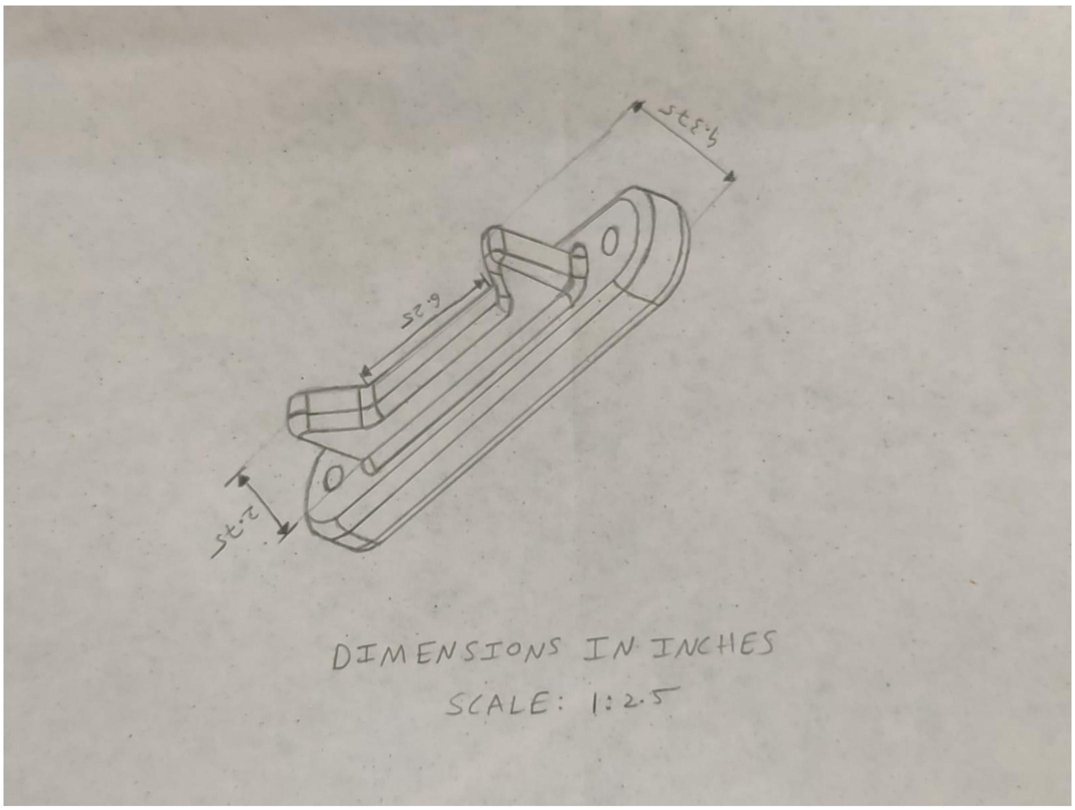


Fig 2: 3d view of the front shock brace (back side)

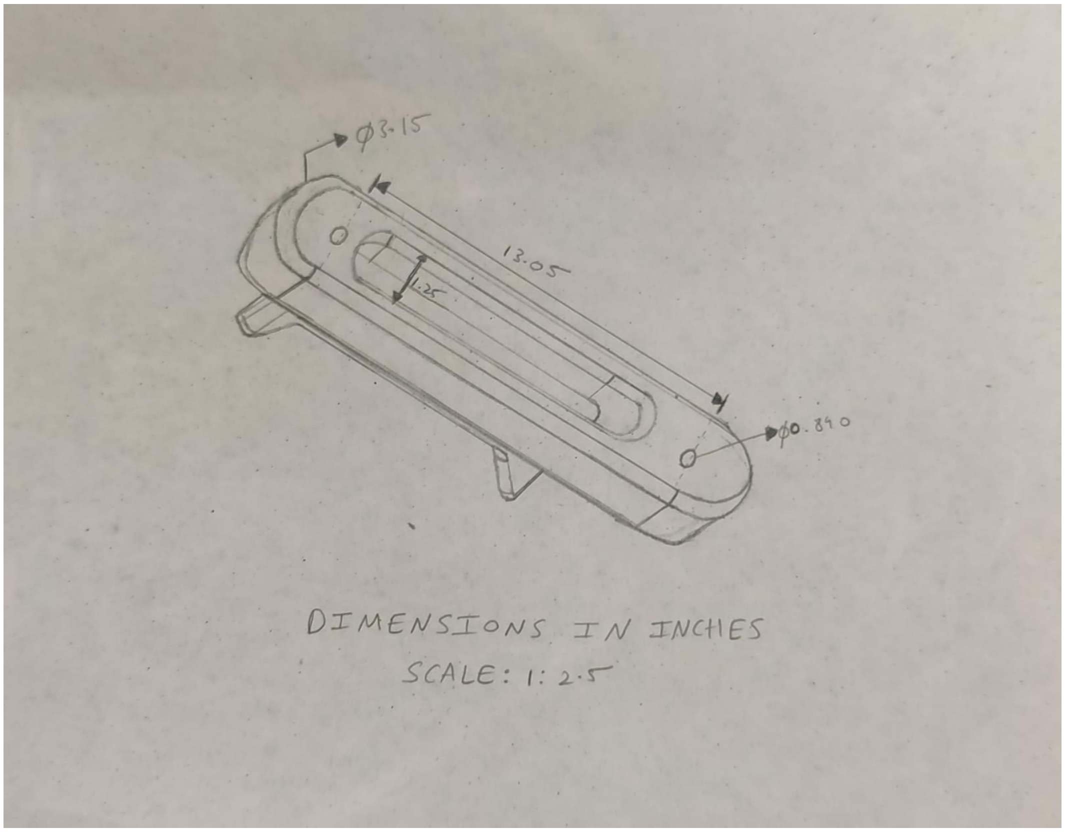


Fig 3: 3d view of the front shock brace (front side)

Reason for selected dimensions

The dimensions of the front shock brace need to be carefully designed to ensure a proper fit within the suspension system. It should align with the mounting points of the shock absorbers and the chassis of the vehicle. If the dimensions are incorrect, it may lead to misalignment, improper installation, or interference with other suspension components, affecting the overall performance and safety of the suspension system. We have decided its length to be 13.05 in as per our model. The dimensions of the front shock brace determine its structural strength and stiffness. It should be designed with adequate thickness (which we have taken as 4.375 in) to withstand the forces and loads experienced during vehicle operation. Suppose the dimensions are too small or insufficient. In that case, the brace may deform or fail under stress, compromising the integrity of the suspension system and potentially leading to handling issues or even accidents.

Materials

The front shock brace in a double wishbone car suspension is typically made from sturdy and lightweight materials that offer the necessary strength and durability. The choice of materials depends on various factors, including cost, weight, manufacturing processes, and performance requirements. A few common materials used for constructing shock braces are steel, aluminium, carbon fibre, titanium etc.

Bhoumik Patidar (22110049)

Shock Absorber

The shock absorber can be subdivided into the following 4 subparts for the purpose of modelling-

Subparts

I. Shock Spring Adjustment Nut

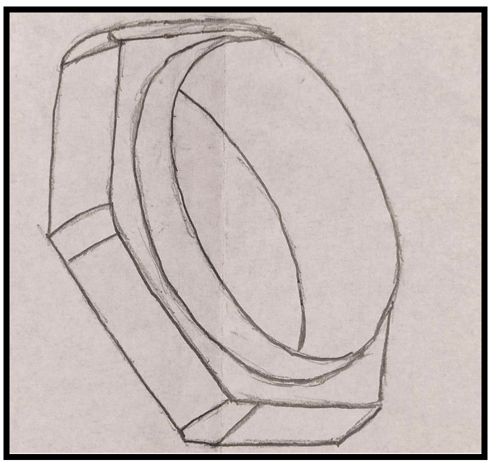


Fig 1 a): Isometric View

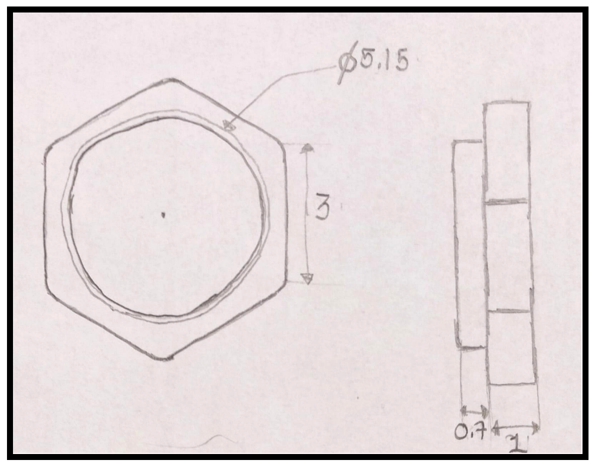


Fig 1 b): Orthographic Views

II. Suspension Spring

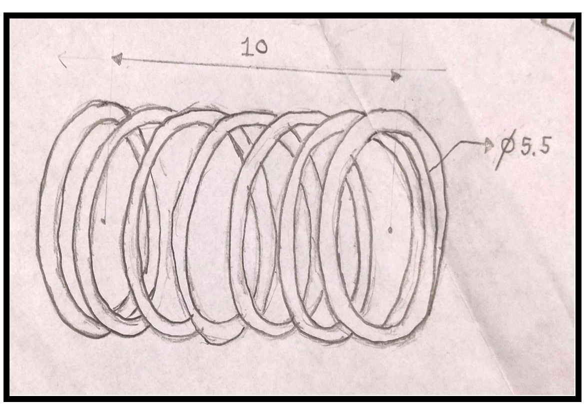


Fig 2 a): Side View

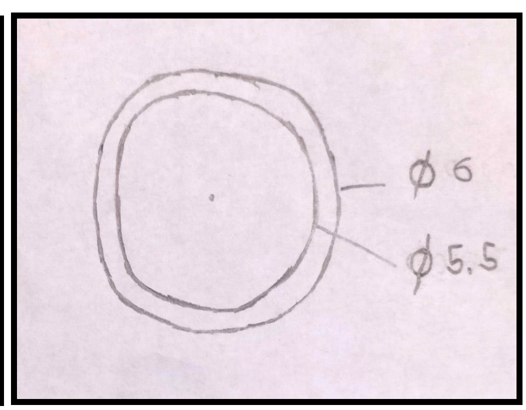


Fig 2 b): Top View

III. Shock Body

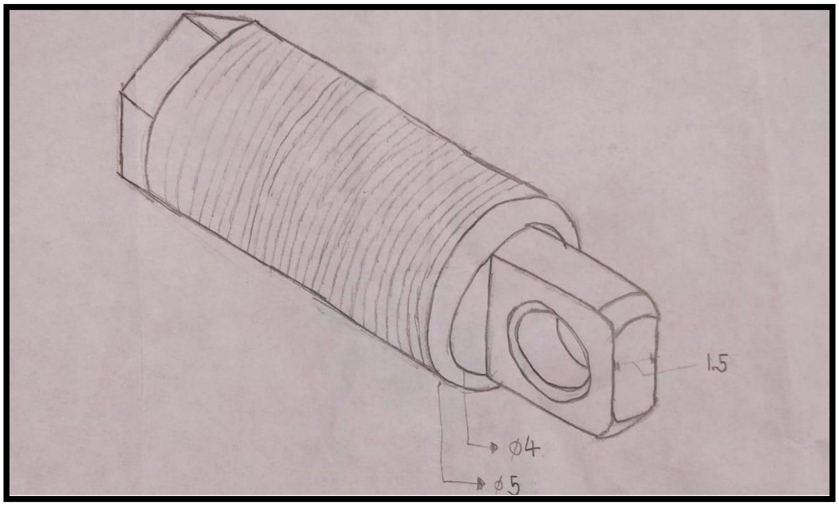


Fig 3 a): Isometric View

It can further be subdivided into two parts-

1. Main Body

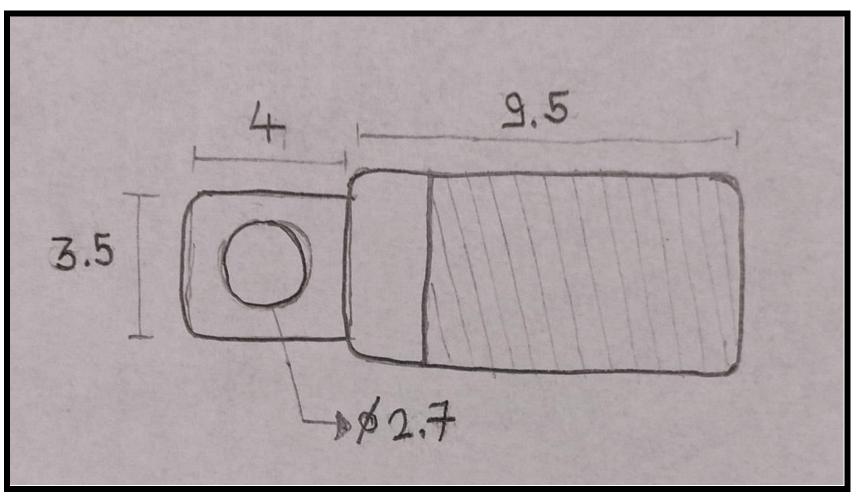


Fig 3 b): Main Body

2. Shock Cartridge

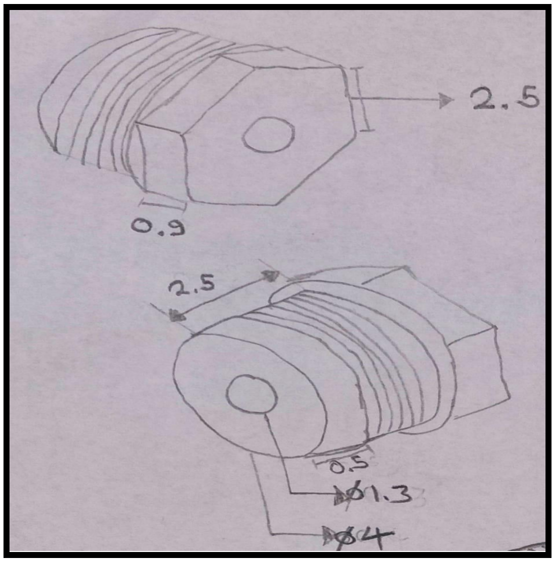


Fig 3 c): Shock Cartridge

IV. Shock Strut

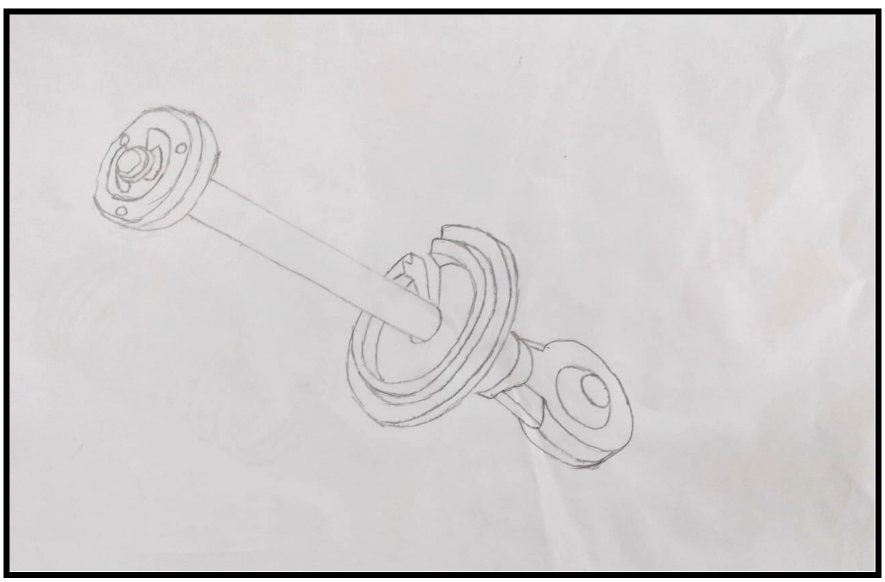


Fig 4 a): Isometric View

It can further be subdivided into 4 parts-

1. Shock Shaft

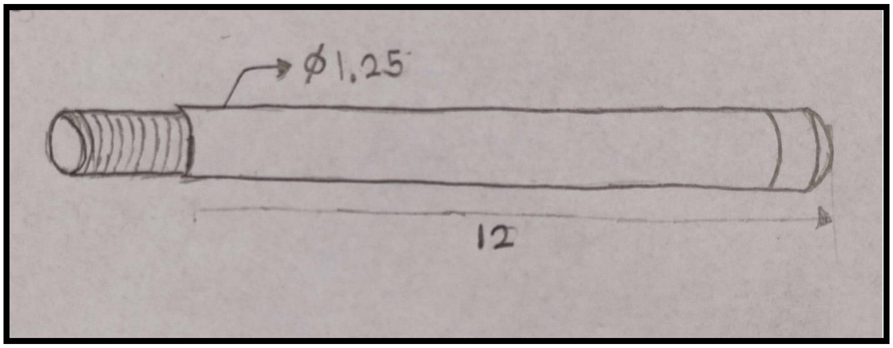


Fig 4 b): Shock Shaft

2. Piston

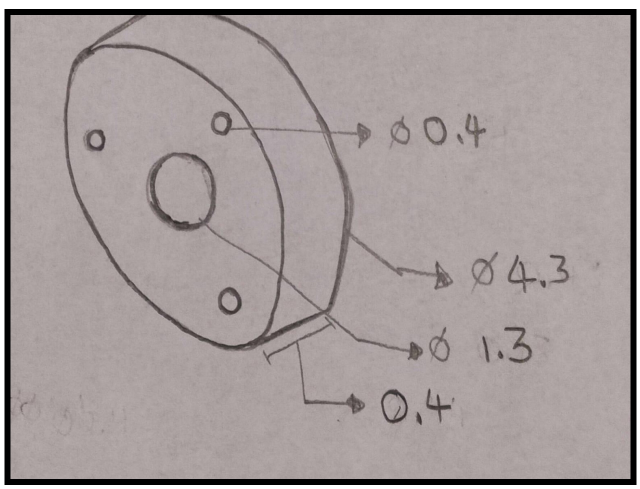


Fig 4 c): Piston

3. Ball End

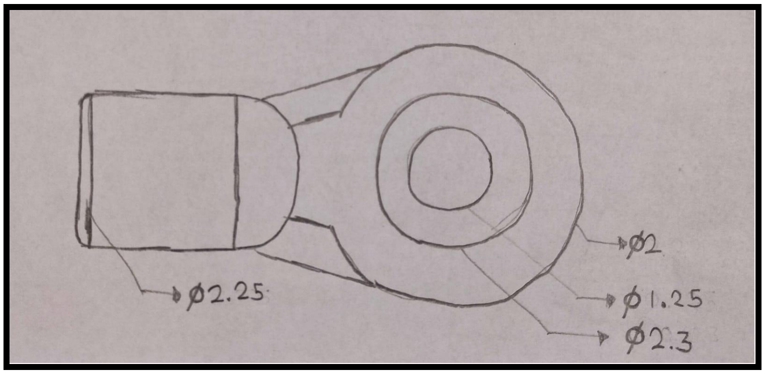


Fig 4 d): Ball End

4. Spring Cup

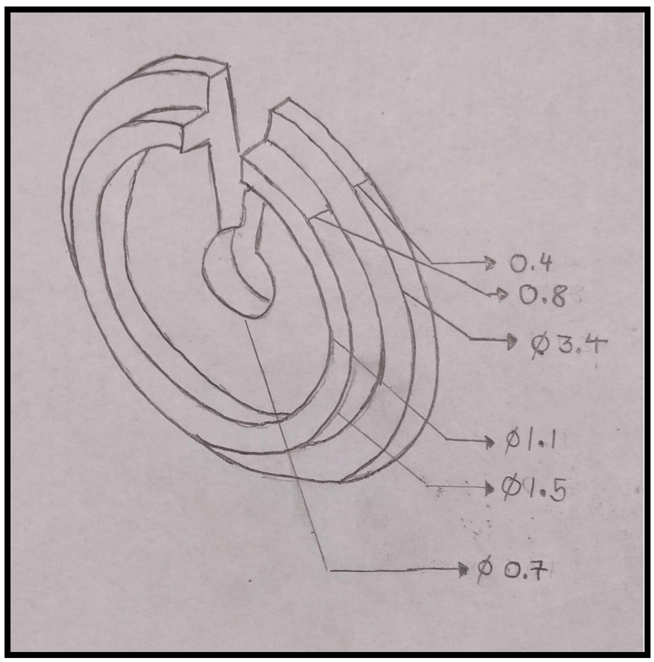


Fig 4 e): Spring Cup

Reason for selected dimensions

The overall dimensioning is based on the database available online of the various technical information on the shock absorber and its further subdivisions.

Shock Spring Adjustment Nut

The diameter of 5.15 in provides sufficient surface area for convenient handling and adjustment. It strikes a balance between being large enough to provide a comfortable grip for manual operation and small enough to fit within the overall design constraints of the shock absorber assembly. The height of 1.7 is appropriate for accommodating the necessary threads and maintaining the required structural integrity.

Suspension Spring

The inner diameter of 5.5 in an outer diameter of 6.0 in ensure proper fitment and alignment with the suspension components. The free length of 10 in represents the uncompressed state of the spring and determines the suspension's resting height.

Shock Body

The outer diameter of 5 in provides sufficient strength and durability to withstand the loads and stresses experienced during operation. The length of 9.5 in was selected to provide adequate stroke length for the shock absorber. This dimension determines the maximum extension and compression of the shock absorber and plays a vital role in controlling the vehicle's suspension movement and handling characteristics.

Shock Strut

Compatibility with the overall shock absorber design was considered for determining the dimensions for the Shock Strut components, which include the Shock Shaft, Spring Cup, Ball End, and Piston. The selected dimensions for each component are as follows:

1. The Shock Shaft: is a critical component that connects the piston to the ball end and provides the necessary movement for damping. The chosen diameter of 1.25 in provides sufficient strength and rigidity to withstand the forces exerted during operation while maintaining the necessary dimensional tolerance for smooth movement and effective damping performance.
2. Spring Cup: The Spring Cup holds and secures the suspension spring in place. The outer diameter of 3.4 allows for proper fitment and alignment with the suspension spring, ensuring secure attachment and providing a sufficient surface area to distribute the load effectively.
3. Ball End: The Ball End serves as a connection point between the Shock Shaft and the suspension arm or mounting point. The chosen inner diameter of 2.25 in provides a suitable size for a secure and reliable connection.
4. Piston: The Piston is a crucial component responsible for regulating the flow of fluid within the shock absorber. The diameter of 1.3 ensures effective fluid flow and damping characteristics.

Materials

1. Shock Body: Made of steel or aluminium alloy.
2. Shock Strut:

   A)Shock Shaft: Hardened steel or stainless steel for strength and corrosion resistance.

   B) Cup: Steel or aluminium alloy to provide strength and secure attachment of the suspension spring.

   C)Ball End: Hardened steel or alloy steel to withstand forces and ensure a reliable connection.

   D)Piston: Steel or aluminium alloy with specific surface treatments for smooth fluid flow and durability.

3. Shock Spring Adjustment Nut: Steel or stainless steel for strength and corrosion resistance.
4. Suspension Spring: High-strength steel or alloy steel, selected for its ability to withstand heavy loads and maintain shape.

Atharva Dapse (22110042)

Wheel

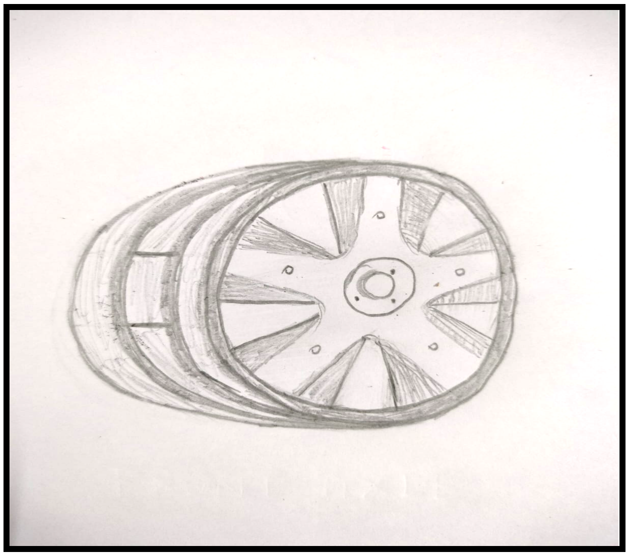


Fig 1: Isometric view

Orthographic views-

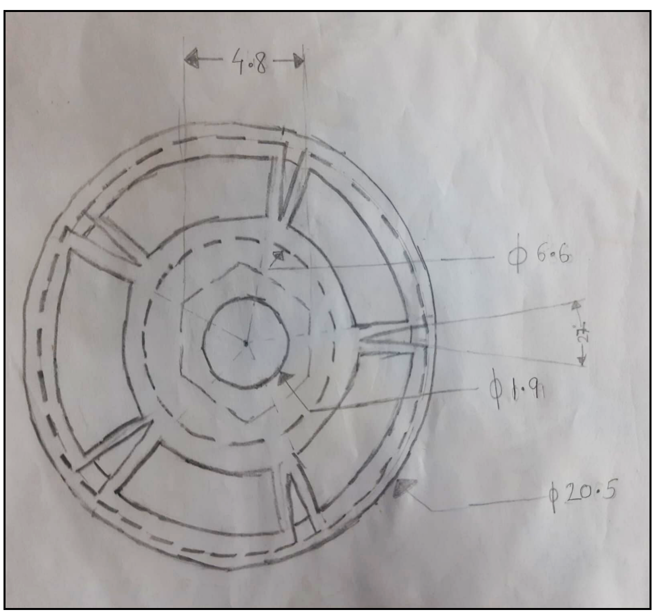


Fig 2: Front view

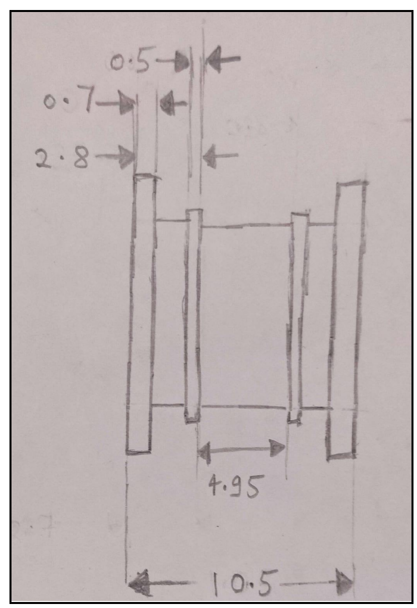


Fig 3: Top / Side view

Reason for selected dimensions

1. **Depth:** The depth of 1.05 units provides sufficient material volume to maintain the wheel's structural integrity while keeping it lightweight. It allows for the proper accommodation of the suspension components and ensures effective load transfer during cornering and braking.
2. **Diameter:** The diameter of 2.05 units was chosen to strike a balance between performance and aesthetics. A larger diameter improves stability and handling by increasing the contact patch with the road, enhancing traction and grip.
3. **Arc Configuration:** The inclusion of five arcs with inner and outer radii of 0.5 and 0.9 units, respectively, was chosen to enhance the wheel's strength and load distribution capabilities. The smaller inner radius provides structural rigidity, while the larger outer radius ensures effective load transfer and stress distribution across the wheel.

Materials for Fabrication and Reasoning

For the fabrication of the wheel, we have selected aluminium alloy (Al6061) as the preferred material. The reasons for this choice are as follows:

1. **Strength-to-Weight Ratio:** Aluminum alloys, such as Al6061, offer an excellent strength-to-weight ratio compared to other commonly used materials. This property ensures that the wheel remains structurally robust while reducing overall weight, which in turn improves vehicle performance, handling, and fuel efficiency.
2. **Machinability:** Aluminum alloys are known for their superior machinability, which facilitates efficient manufacturing processes. The ease of machining allows for precise shaping, accurate tolerance control, and reduced production time.
3. **Corrosion Resistance:** Aluminum alloys are highly resistant to corrosion, ensuring the longevity and durability of the wheel even under harsh environmental conditions. This characteristic is crucial for automotive applications where exposure to moisture, road salt, and other corrosive elements is common.

Bhavik Patel (22110047)

Front Side Plate (Left and Right)

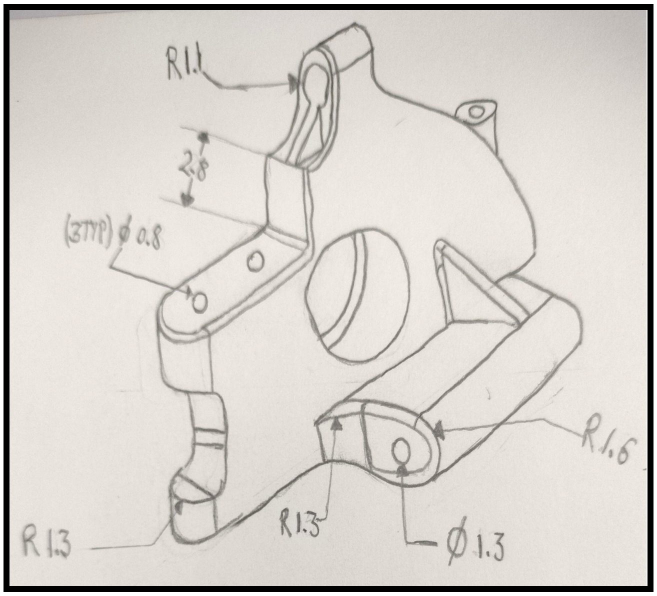


Fig 1: Isometric view of Front Side Plate

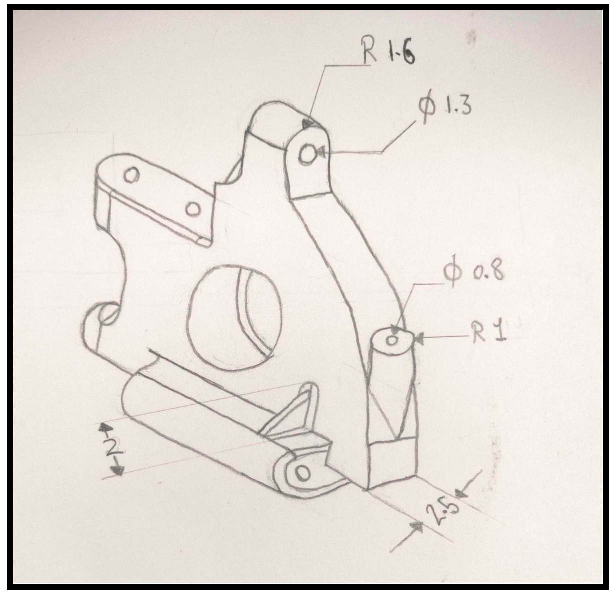


Fig 2: Isometric view of Front Side Plate

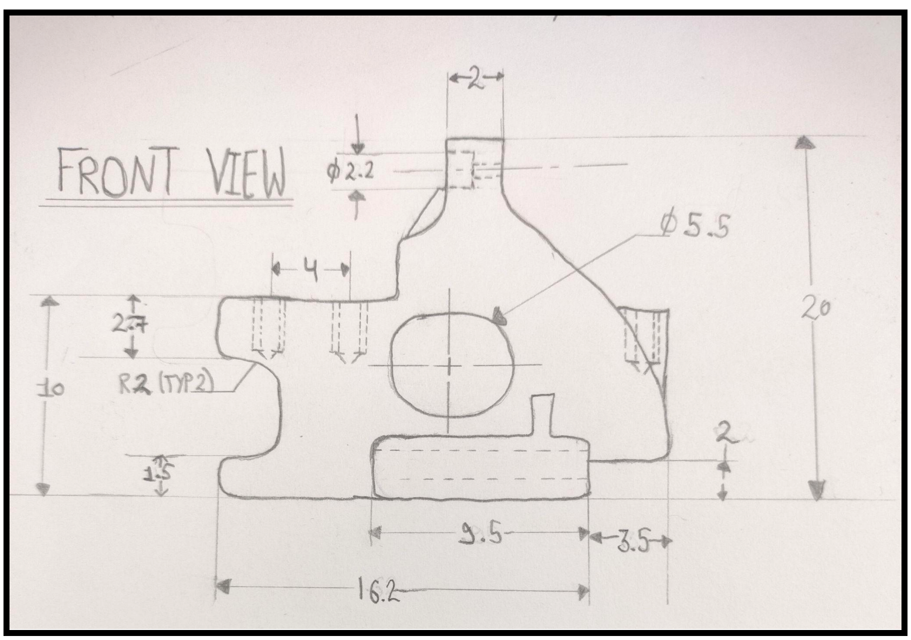


Fig 3: Front View of Front Side Plate

Reason for selected dimensions

The front side plate is essential to the double wishbone car suspension system. Its primary role is to provide structural support and stability to the suspension assembly, particularly in the front of the vehicle.

The dimensions of the front side plate are chosen to ensure proper fitment and compatibility with other suspension components. This includes attachment points for the upper arm mount, shock absorbers, shock brace, and other related parts. The selected dimensions enable seamless integration and alignment between these components, allowing for smooth operation and optimal suspension performance.

The holes are dimensioned carefully to enable it to be fitted smoothly with an upper arm mount and shock absorber through nuts and bolts.

Additionally, I have provided fillets at all the edges to distribute the stress concentrations along the edges and enhance the fatigue resistance of the material. Edges with high stress are given a larger fillet radius of about 1.3 inches, and edges with less stress are given fillets of 0.3-inch radius, as larger fillets tend to distribute stress more effectively.

Materials

The material selection for the front side plate is crucial as it directly impacts the overall performance and longevity of the suspension system. It must be capable of withstanding the dynamic loads, road vibrations, and impacts encountered during driving. Furthermore, the material should also provide good corrosion resistance and fatigue strength to ensure long service life. To ensure the required strength and durability, the front side plates are commonly made up of materials such as **forged or cast aluminium or steel**. These materials offer excellent rigidity and structural integrity, enabling the front side plate to withstand the forces and stresses associated with vehicle operation.

Atharva Bodhale (22110043)

Front Upper Arm

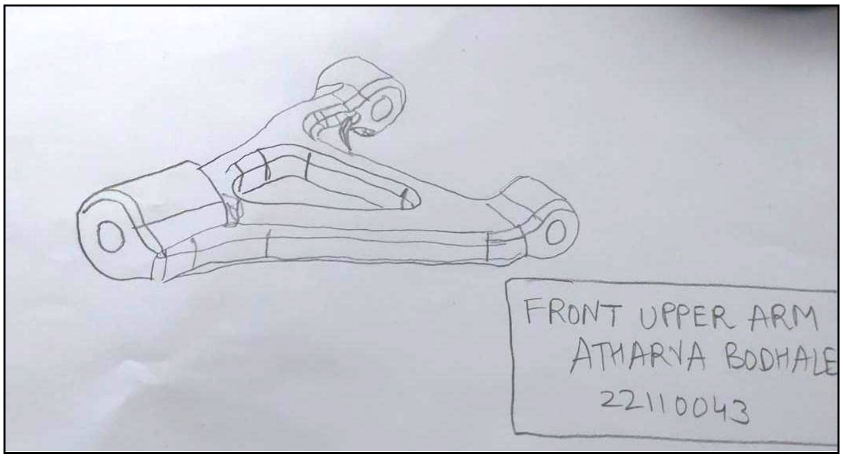


Fig 1: Isometric View of Front Upper Arm

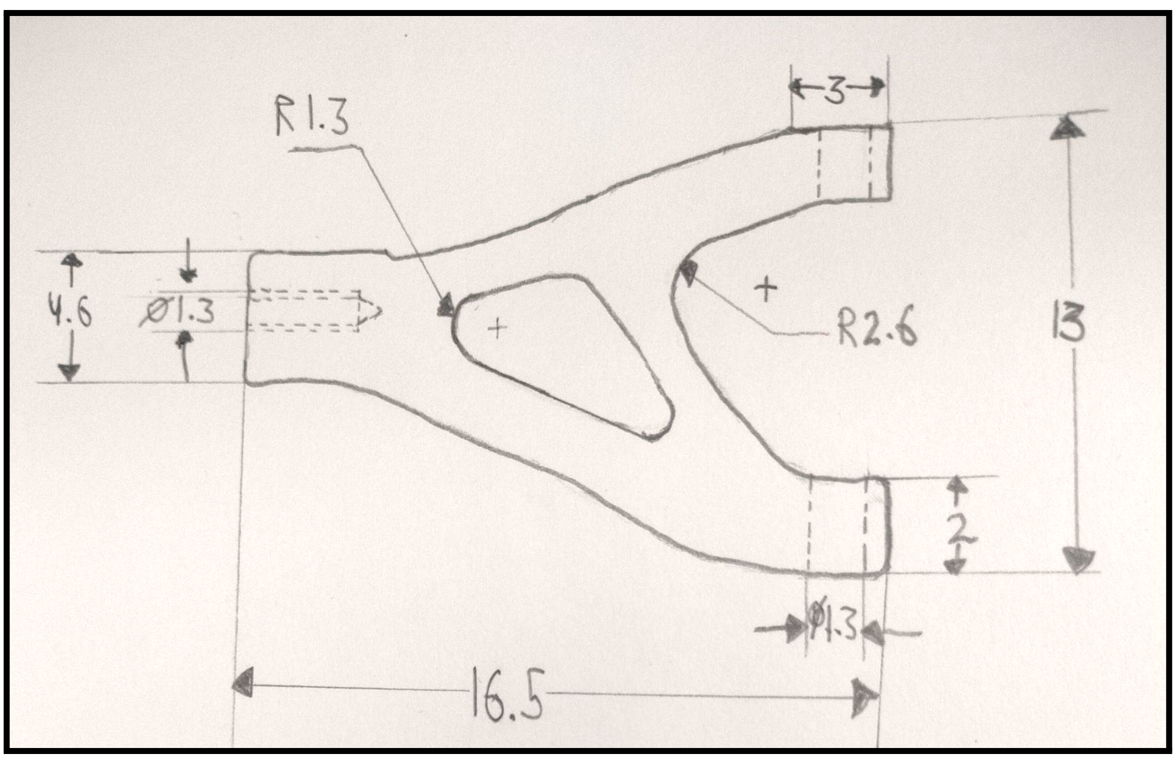


Fig 2: Front View of Front Upper Arm

Reason for selected dimensions

The dimensions of the front upper arm of a suspension system are determined by various factors, including suspension geometry, wheel alignment adjustments, suspension travel and range of motion, packaging constraints, material strength and weight, and manufacturing considerations. The dimensions of the upper arm affect the suspension's ability to absorb impacts and maintain control over uneven surfaces. Additionally, packaging constraints are important. The upper arm needs to fit within the available space in the engine compartment while accommodating other components like shock absorbers and steering mechanisms. Considering all the above factors, the specified dimensions (given in the image attached) have been given to the front upper arm.

Materials for Fabrication and Reasoning

1. Materials: Front upper arms are typically made of either steel or aluminium alloys.
2. Steel: Steel is commonly used due to its high strength, durability, and resistance to bending and twisting forces.
3. Aluminum Alloys: Aluminum is lighter than steel, offering weight savings and improved fuel efficiency. It also has good stiffness properties.
4. Strength: Both steel and aluminium provide sufficient strength for front upper arm applications, with steel generally being stronger.
5. Cost: Steel upper arms are often more cost-effective compared to aluminium, making them commonly used in mass-production vehicles.

Jay Bhateriya (22110046)

Tire

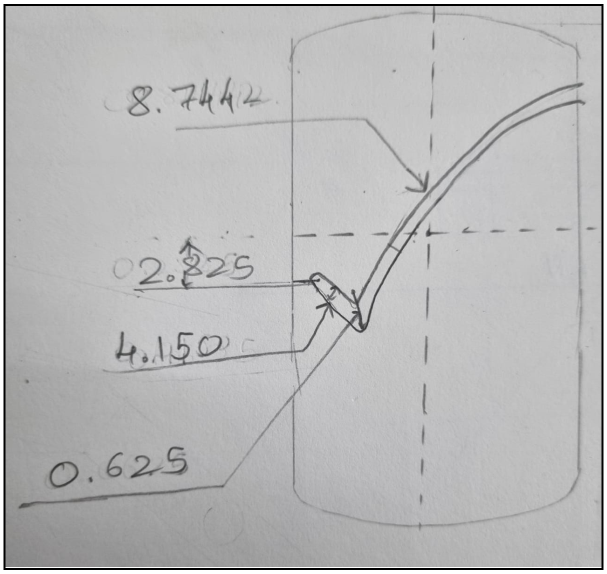


Fig 1: Dimensions of tread

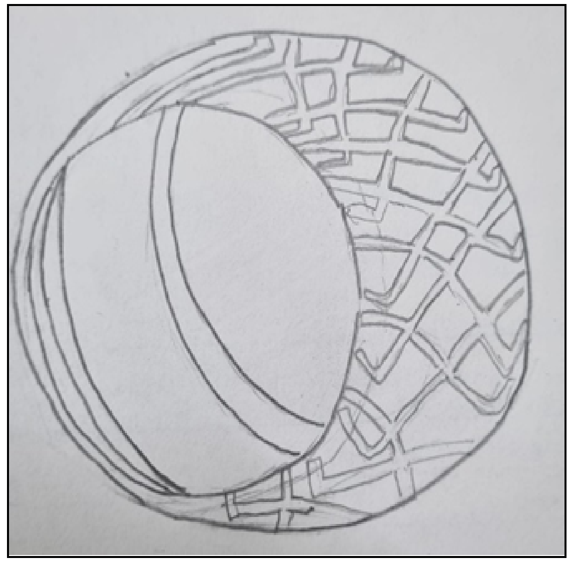


Fig 2: 3D view of tire

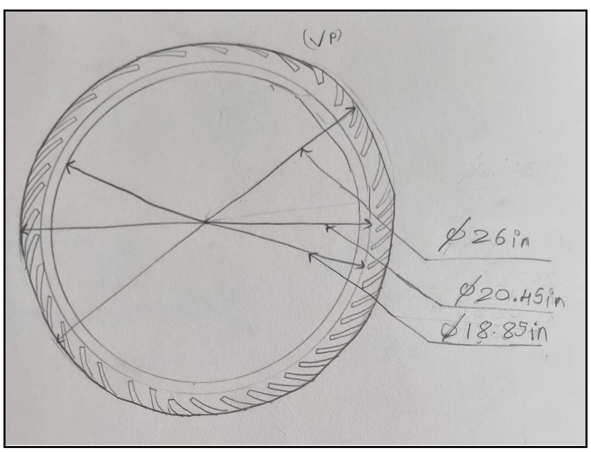


Fig 3: Front view of tire

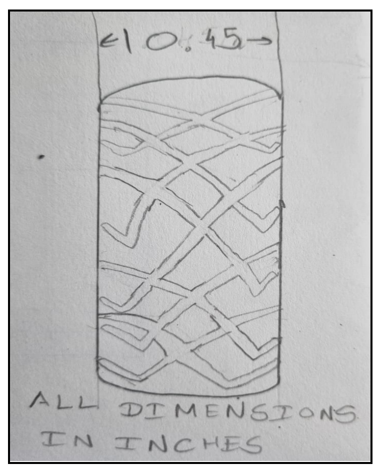


Fig 4: Top view of tire

Reason for the selected dimensions

The part tire is a very important part of the car suspension model and correct dimensions should be used to avoid problems during the assembling and making the final product on Auto Desk Inventor. The most important dimensions of the part are the diameters of the tire. They are

- Outer diameter: 26 in
- Middle diameter: 20.45 in
- Inner diameter: 18.85 in
- Fillet radius: 10 in

The correct dimensions are very important for this part as the assembly of the Tire and Wheel will not happen accurately during the making of the final product and subsequently will not be able to assemble with the rest of the components of the model.

The width of the tire is selected at 10.45 inches. The high width of the tires will give better grip and traction between the surface and the tire since it is the only component of a car which comes in contact with the surface of the road.

Other important dimensioning includes the tread design. The dimensions are:

- The major arc: 8.7442 in
- Fillet radius: 0.625 in
- Width of tread: 0.415 in
- The minor arc: 2 in

Materials for Fabrication and Reasoning

Tires depend on the materials which provide strength, durability and flexibility. It needs materials which can provide these properties.

Rubber: It is the main component used while making the main body and the curved surface of the tire. Tires use synthetic rubbers, which are made by mixing natural rubber and latex. They provide flexibility, elasticity and traction to the tires.

Fabric: Tires are made up of layers of fabric which usually consists of polyester, rayon and nylon. These fabrics are coated with rubber for better adhesion.

Steel wires: Steel wires or cords are incorporated into the tire to enhance its strength and resistance to deformation. Steel belts are commonly used in radial tires to provide stability and improve handling.

Chemicals: The rubber compound can be enhanced using chemicals. Various chemicals and additives are mixed into the rubber compound to enhance specific properties. These may include sulphur, accelerators, antioxidants, fillers, and plasticisers. They affect the tire's curing process, durability, and performance characteristics.

Inner Liner: The inner liner is usually a compound derived from rubber which has excellent air retention capabilities. It provides a barrier to maintain tire pressure and prevent air leakage.

The Bead Wires: These wires are made from high-strength steel wires, and it is used to create the inner edge of the tire. It ensures that the tire is attached properly to the rim and keeps the tire in good shape.

Mamta Bhambhani (22110045)

Front Upper Arm Mount

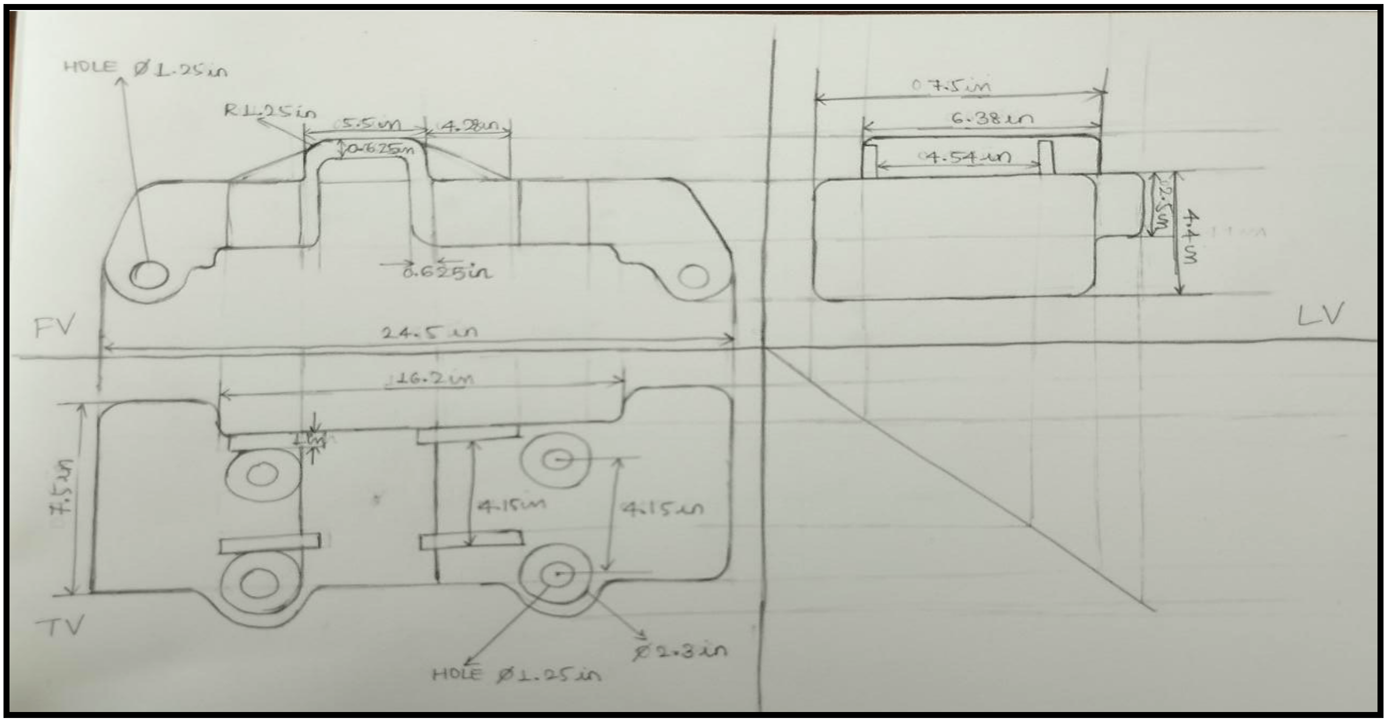


Fig 1: Orthographic View of Front Upper Arm Mount

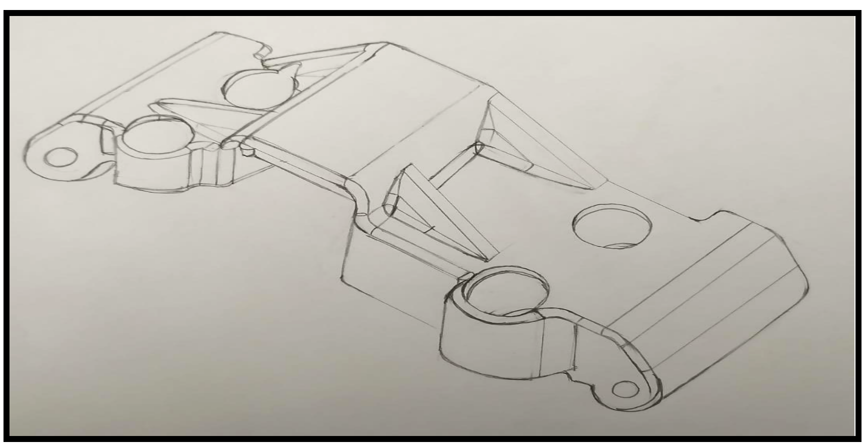


Fig 2: Isometric View of Front Upper Arm Mount

Reason for selected dimensions

In a double wishbone suspension system used in cars, the front upper arm mount plays a crucial role in supporting and controlling the movement of the suspension components. The dimensions of the front upper arm mount are carefully designed to ensure optimal suspension performance and handling characteristics.

The front upper arm mount is typically positioned at the chassis or body of the vehicle and serves as the attachment point for the upper control arm of the suspension system. The upper control arm, also known as the wishbone, is a suspension component that connects the wheel hub assembly to the chassis and helps control the vertical movement of the wheel.

When it comes to the dimensions of the front upper arm mount, several factors are considered during the design process. These factors include the desired suspension geometry, vehicle dynamics, and packaging constraints. The dimensions of the mount determine the position, angle, and orientation of the upper control arm, which directly affects the suspension's performance.

One critical dimension is the height or vertical position of the mount. The height determines the ride height of the vehicle, which is the distance between the ground and the chassis. The mount's height affects the suspension's travel range, the vehicle's ground clearance, and its overall handling characteristics. A lower mount height can provide a lower centre of gravity, improving stability and handling but sacrificing ground clearance.

Additionally, the angle and orientation of the mount are crucial for determining the suspension's camber and caster angles. Camber refers to the tilt of the wheel relative to the vertical axis, while caster relates to the forward or backward tilt of the steering axis. These angles have a significant impact on tire wear, stability, and steering response. The dimensions of the front upper arm mount, along with the other suspension components, are adjusted to achieve the desired camber and caster angles for optimal performance. Considering the above constraints in mind, I have chosen the above dimensions

Materials

The front upper arm mount of a car suspension can be manufactured using various materials, depending on factors such as cost, strength requirements, weight, and manufacturing processes.

1. **Steel**: Steel is commonly used due to its strength and durability. It can handle heavy loads and provide stiffness to the suspension components.
2. **Aluminum**: Aluminum is a lightweight material and is corrosion-resistant. It is often used to reduce the overall weight of the vehicle to improve fuel efficiency.
3. **Composite Materials**: Composite materials, such as Carbon Fiber Reinforced Polymers (CFRP) or Fiberglass Reinforced Polymers (FRP) offer high strength, low weight, and excellent fatigue resistance. However, these materials are expensive and require specialized manufacturing techniques.
4. **Forged or Billet Aluminum**: These materials have strength and stiffness compared to standard cast aluminium. They are often used in high-performance vehicles to enhance suspension performance and reduce weight.

Shivrajsinh Bhosale (22110048)

Front Hub Carrier (Left and Right):

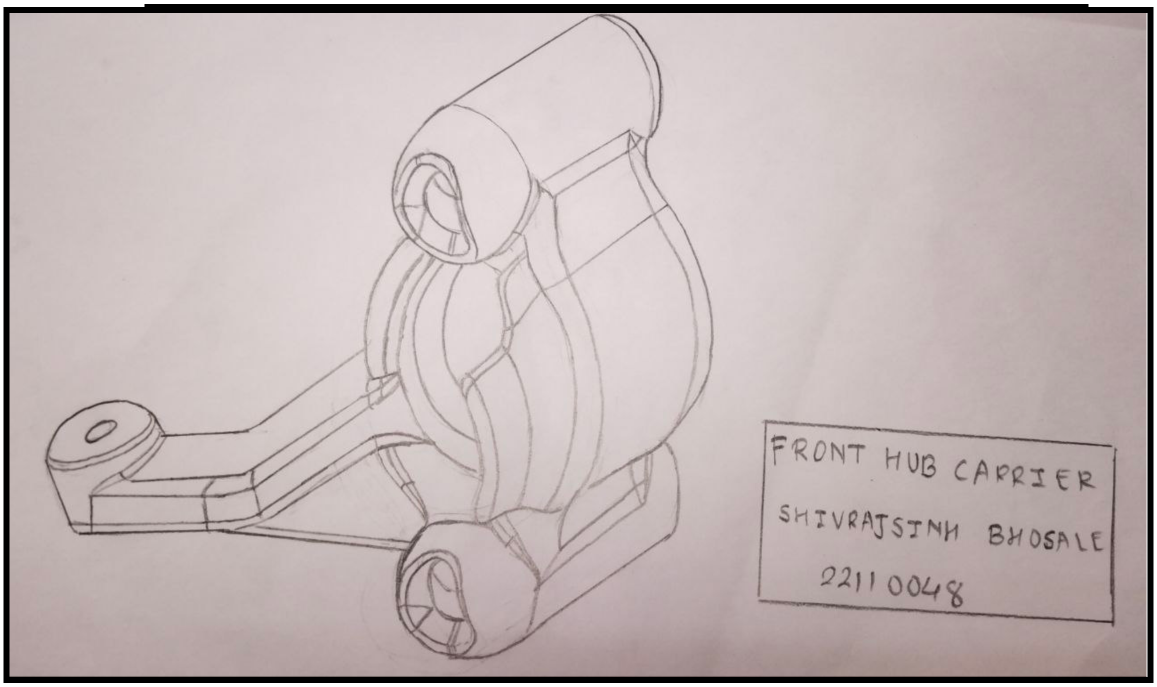


Fig 1: Isometric View of Front Hub Carrier (Left)

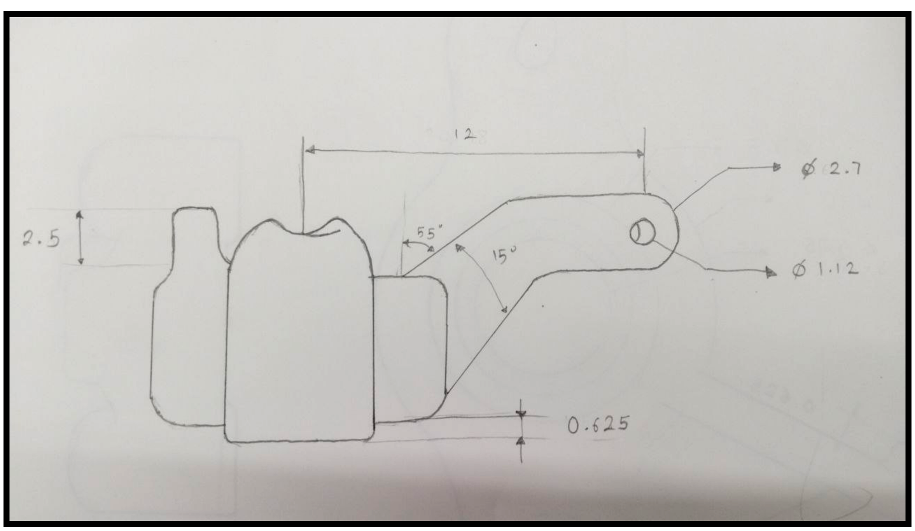


Fig 2: Isometric Top View

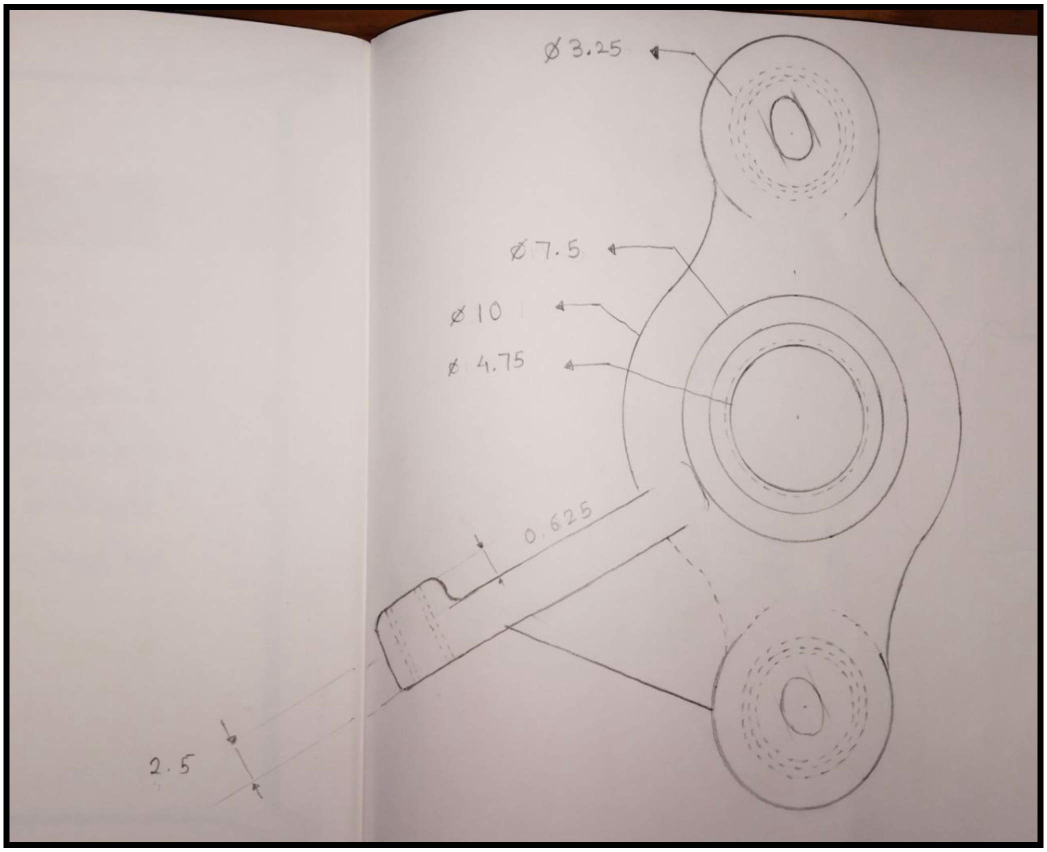


Fig 3: Isometric Front View

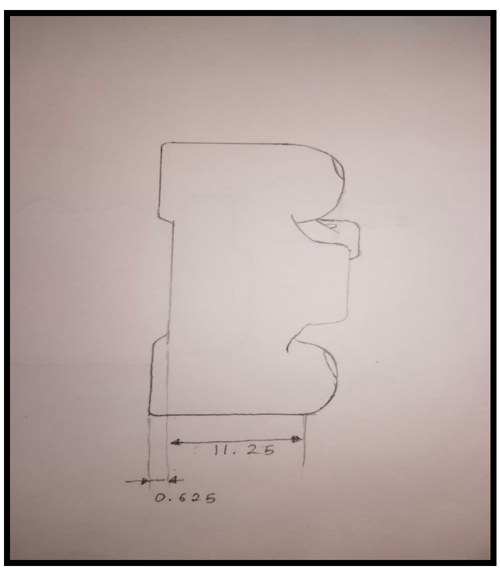


Fig 4: Isometric Side View

Reason for selected dimensions

The front hub carrier is an integral component of the double wishbone suspension system in a car. This suspension design is known for its superior handling and ride comfort, and the dimensions of the front hub carrier play a crucial role in achieving these characteristics.

The front hub carrier is a sturdy and rigid structure that connects the suspension components to the vehicle's chassis. It serves as a mounting point for various components, including the upper and lower control arms, the steering knuckle, and the wheel hub assembly. The dimensions of the front hub carrier are carefully designed to ensure proper alignment and positioning of these components.

One important dimension of the front hub carrier is its width. The width of the hub carrier determines the distance between the upper and lower control arms. This dimension directly affects the suspension geometry and the overall handling of the vehicle. A wider hub carrier can provide better stability during cornering, as it increases the track width of the vehicle. On the other hand, a narrower hub carrier can enhance manoeuvrability and agility, making the car more responsive to steering inputs. The width of the front hub carrier is carefully balanced to achieve the desired balance between stability and manoeuvrability.

Another critical dimension of the front hub carrier is its height or vertical distance from the ground. The height of the hub carrier determines the vehicle's ride height or ground clearance. It plays a crucial role in determining the car's ability to tackle various road conditions, including uneven surfaces, speed bumps, and potholes. A higher hub carrier provides greater ground clearance, which is desirable for off-road or rough-road driving. Conversely, a lower hub carrier contributes to a lower centre of gravity, improving stability and handling performance on smooth roads or during high-speed manoeuvres.

Additionally, the shape and contour of the front hub carrier are also significant. The design of the hub carrier should allow for proper suspension travel and wheel articulation while maintaining structural integrity. It should provide sufficient space for the suspension components to move up and down, accommodating the vertical motion of the wheels when encountering bumps or road imperfections. The shape of the hub carrier can also impact weight distribution and weight transfer during acceleration, braking, and cornering, influencing the overall balance and handling characteristics of the vehicle.

Materials:

The front hub carrier can be made from materials depending on their mechanical characteristics, weight, and cost. The full contact and the intended balance between performance and cost will determine the material to use. Following are some frequently used materials:

1. Steel: Steel alloys with exceptional strength, stiffness, and endurance, such as high-strength low-alloy (HSLA) steels or forged steels, are frequently used in construction. Steel is able to handle the heavy loads and stresses applied to the front hub carrier and offers good impact resistance. It is a well-liked option in many applications due to its affordability and accessibility.

2. Aluminum: Lightweight alloys like Aluminium are popular because they can assist sider unsprung weight and increase fuel efficiency. Aluminium is easily machined and gives good corrosion resistance.

3. Composite Materials: Advanced composite materials like CFRP or GFRP are gaining popularity in high-performance applications. These materials have excellent corrosion resistance, strength-to-weight ratio, and design flexibility. Composites, however, can cost more and call for unique manufacturing methods.

Astitva Aryan (22110041)

Front Axle System

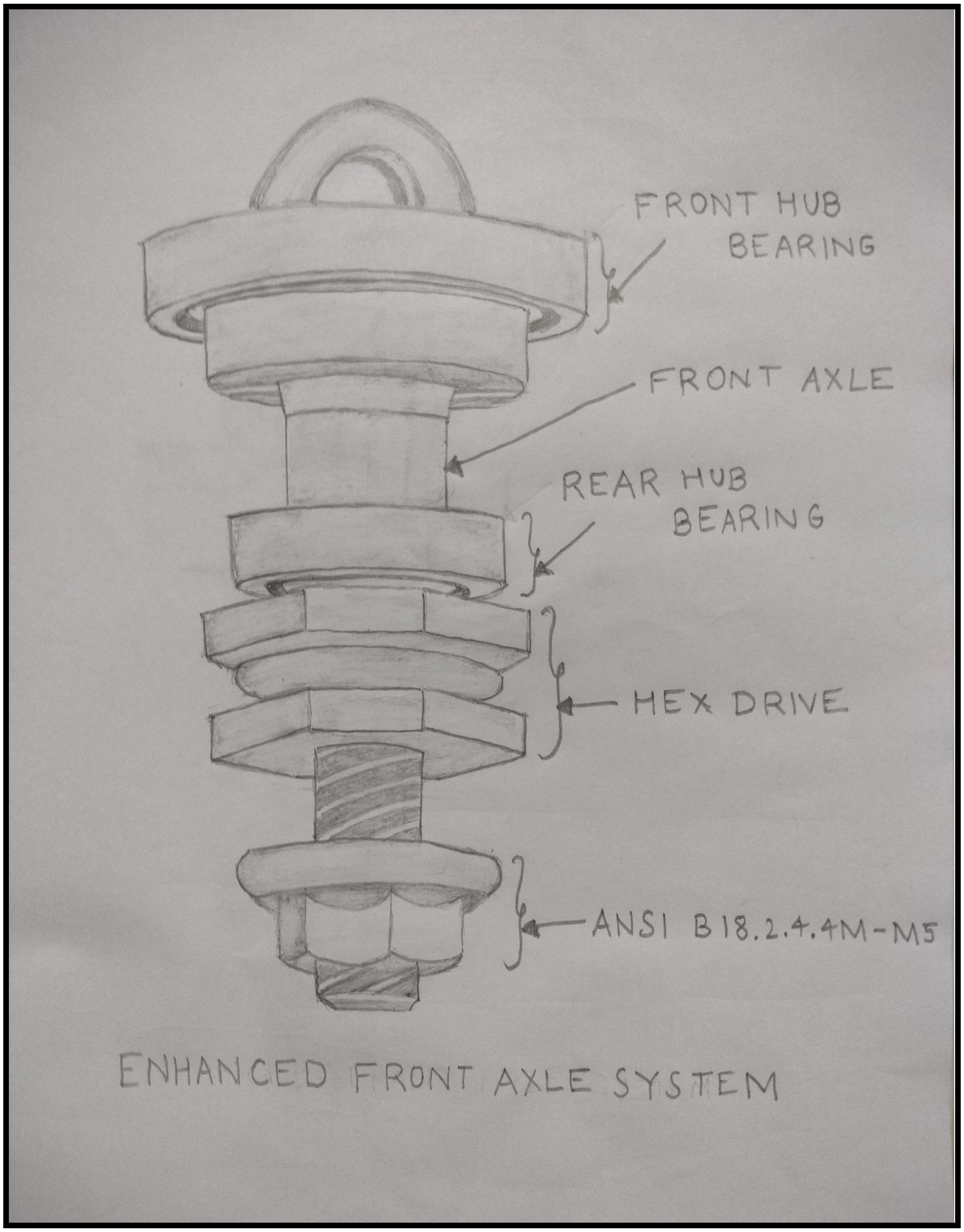


Fig 1

It consists of the following critical components-

Subparts

1. Front Axle

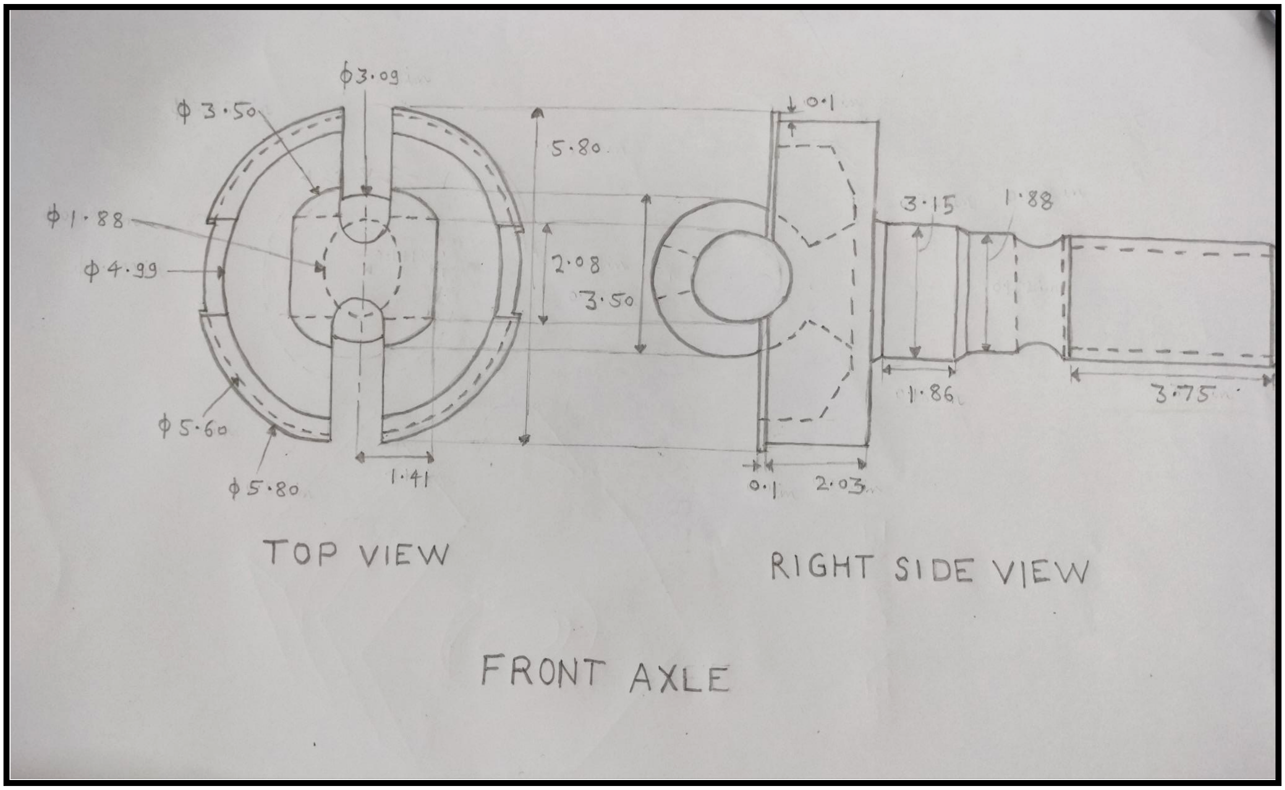


Fig 2

2. Hex Drive

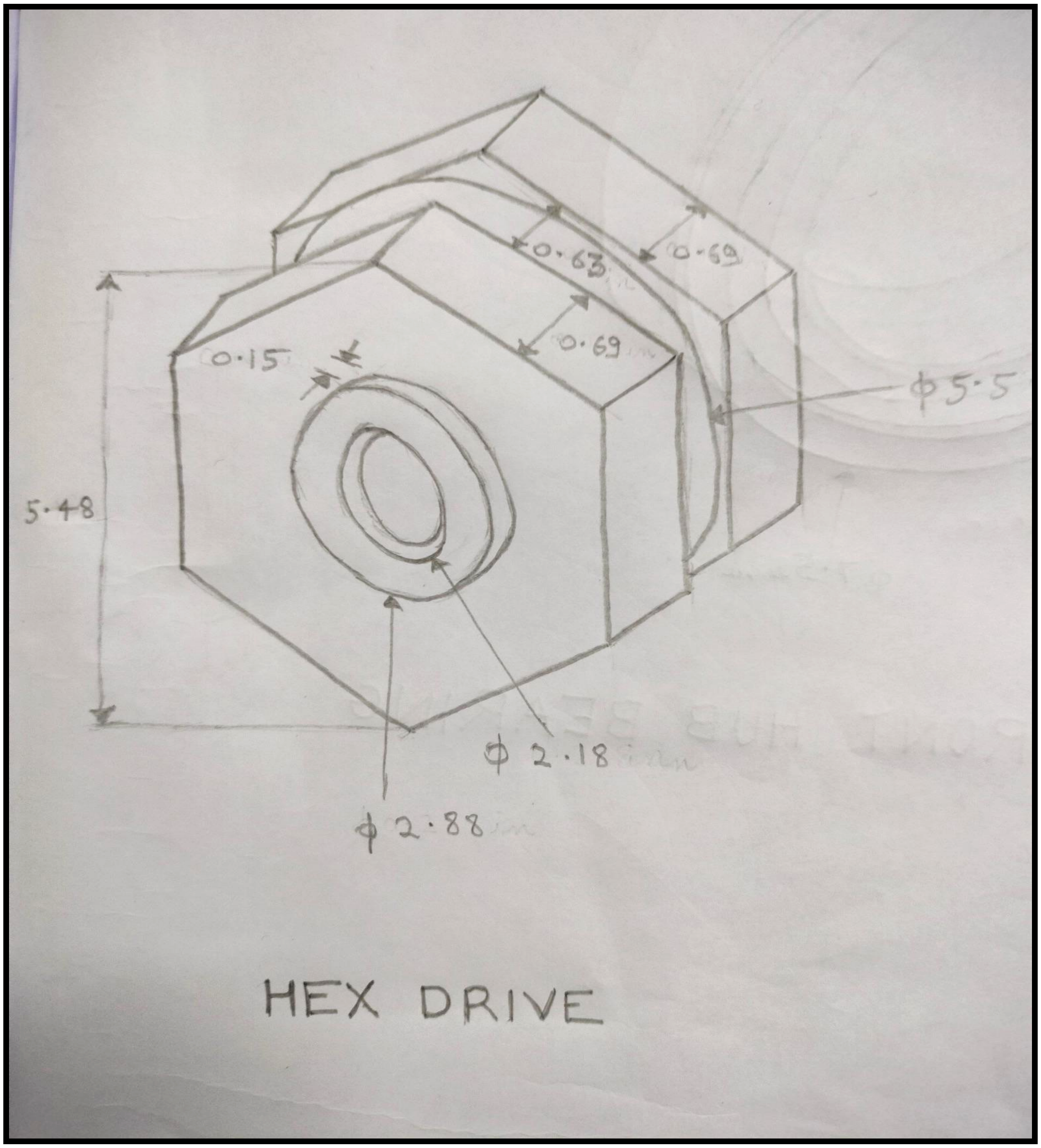


Fig 3

3. Front Hub Bearing

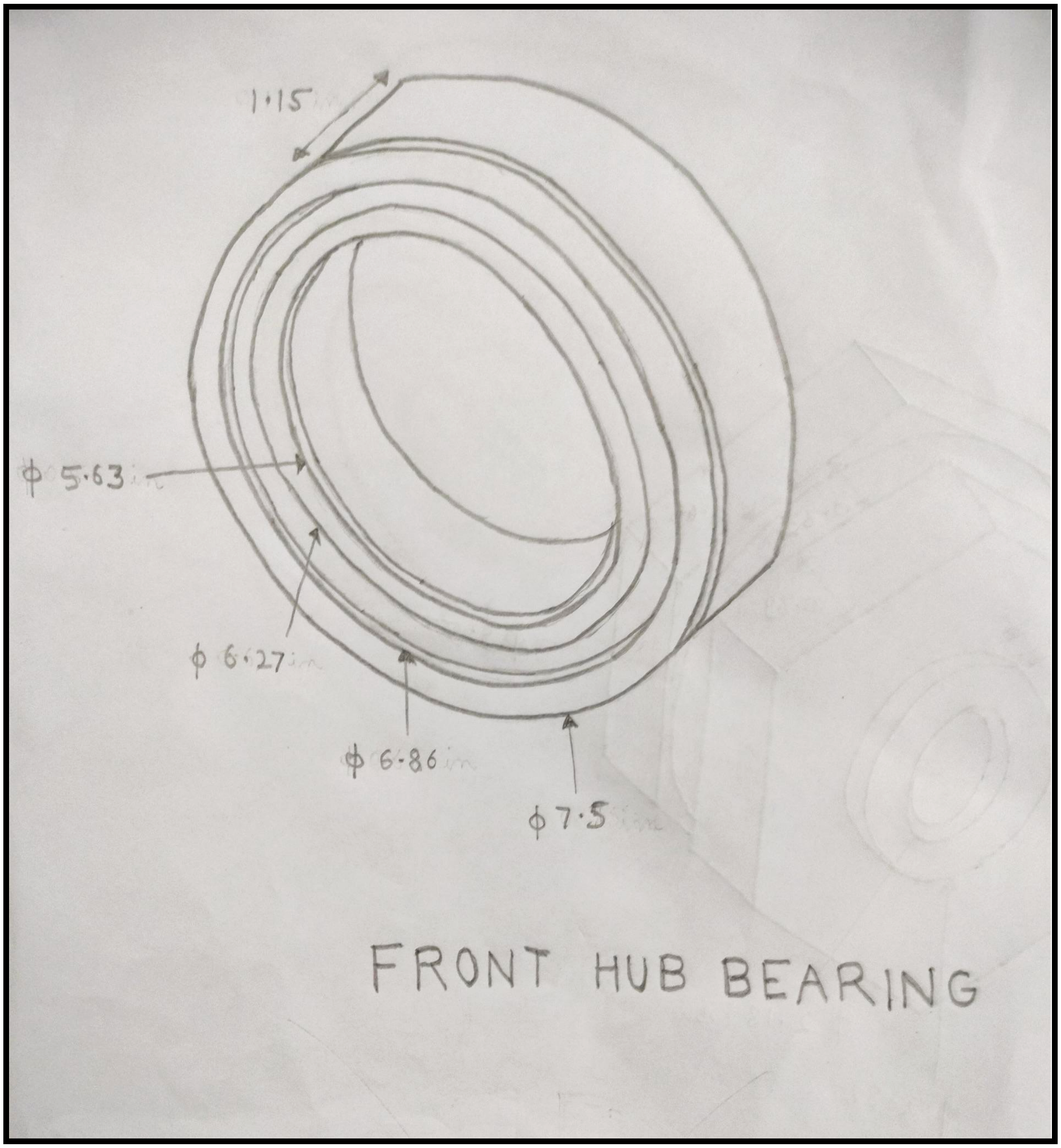


Fig 4

4. Rear Hub Bearing

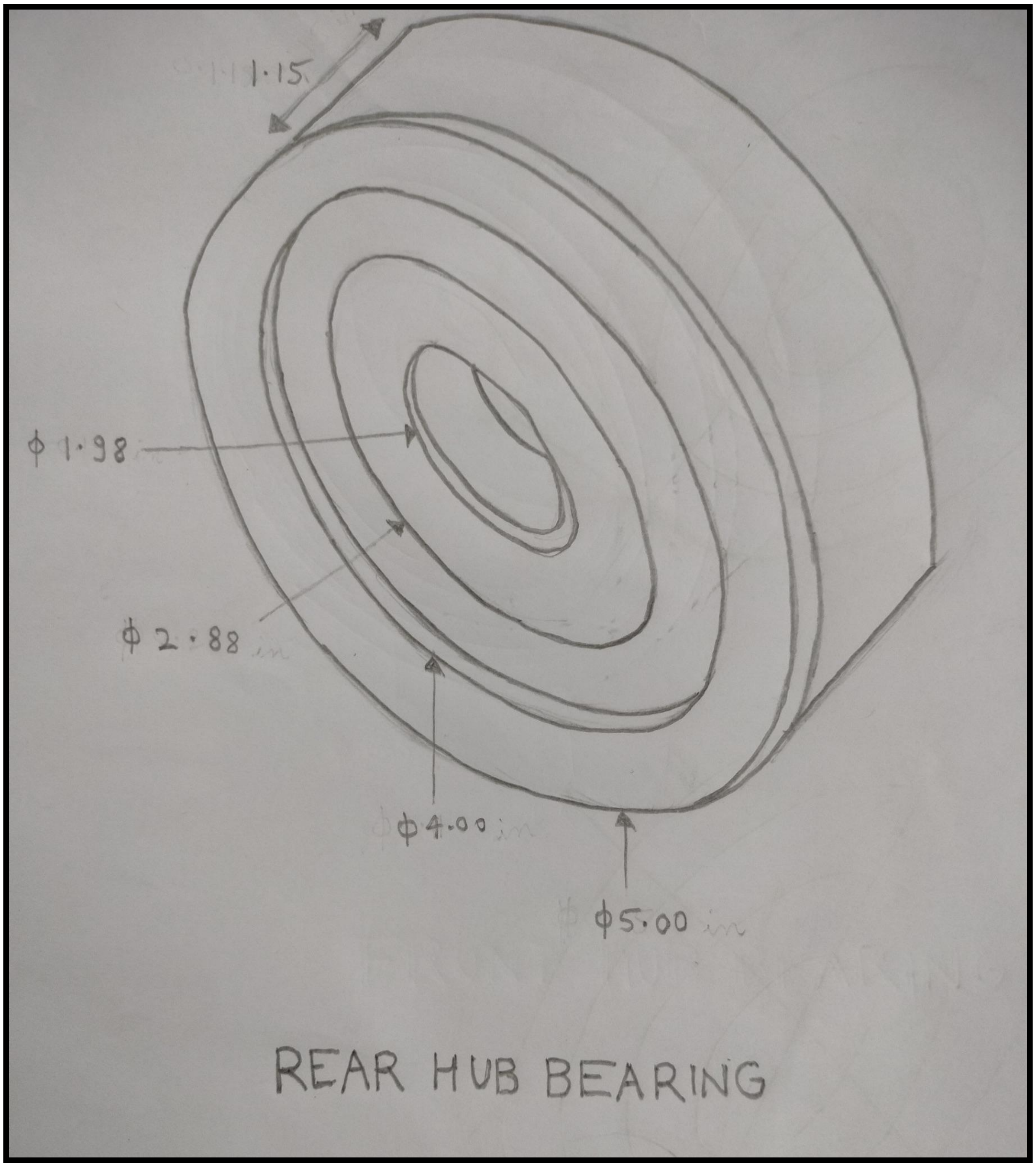


Fig 5

Reason for selected dimensions

1. Hex Drive:

I selected the dimensions for the hex drive to ensure proper engagement within the front axle system. I chose a total thickness of 2.01 inches to provide sufficient material strength and rigidity for effective torque transmission. The height of 5.48 inches allows the hex drive to fit properly within the assembly. The hole at the centre, with an inner diameter of 2.18 inches and an outer diameter of 2.88 inches, is designed to precisely fit the front axle, enabling a close-fitting connection.

2. Front Hub Bearing:

I selected the dimensions of the front hub bearing to meet the requirements of the wheel assembly and ensure smooth and reliable rotation. A larger outer diameter of 7.5 inches allows the bearing to fit properly within the wheel hub, providing sufficient contact area. The inner diameter of 5.63 inches corresponds to the axle diameter, ensuring proper alignment and secure attachment. I chose a thickness of 1.15 inches to provide the necessary support and stability for the bearing to withstand radial and axial loads.

3. Rear Hub Bearing:

For the rear hub bearing, I selected dimensions that effectively support the rear part of the assembly. The reason is the same as in the case of the front hub-bearing.

4. Front Axle:

I chose the height dimension of the front axle to position the axle system at the centre of the wheel in the car suspension system. By placing the front axle at the centre, I can distribute the weight evenly across the wheels, optimizing the vehicle's stability, handling, and overall performance. Additionally, the height of 18.75 inches meets the specific requirements of the suspension system.

In summary, I selected the dimensions for the "Front Axle System" components based on their functional requirements, compatibility with other components, and load-bearing capabilities. The selected dimensions for the "Front Axle System" components are based on a thorough analysis of the available online technical information.

Materials:

Here are some commonly used materials for each component along with their reasons:

1. Hex Drive:

Material options: Steel alloys (e.g., carbon steel, alloy steel)
Reason: Steel alloys are widely used for their excellent strength, durability, and high load-bearing capacity. They offer good resistance to wear, corrosion, and impact, making them suitable for transmitting torque effectively in the front axle system.

2. Front Hub and Rear Hub Bearing:

Material options: Bearing-grade steel, stainless steel
Reason: Bearing-grade steel is commonly used for hub bearings due to its high strength, fatigue resistance, and ability to withstand heavy loads. It provides excellent durability and reliability for extended service life. Stainless steel is also used for its corrosion resistance, making it suitable for applications where moisture or harsh environments are a concern.

3. Front Axle:

Material options: Alloy steel, forged steel
Reason: The front axle is subjected to significant loads and stresses, requiring materials with high strength and rigidity. Alloy steel and forged steel provide excellent mechanical properties and durability, making them suitable for heavy-duty applications.

Meeting Details

Meeting 1:

Date: 15/May/2023
Topic: Introduction, brainstormed ideas for the modelling project

Meeting 2:

Date: 17/May/2023
Topic: Discussed viability of various ideas and finalizing 'Double Wishbone Suspension System'.

Meeting 3:

Date: 18/May/2023
Topic: Discussed our research on the decided topic and preliminary discussion on its breakdown into components.

Meeting 4:

Date: 20/May/2023
Topic: Frameworked a proper division of the Suspension System and allotment to members for proposal sketches.

Meeting 5:

Date: 25/May/2023
Topic: Discussion for resolution of mistakes in sketches and further changes to ensure the integrity of the whole model.

Meeting 6:

Date: 28/May/2023
Topic: Discussion on dimensioning of the individual parts.

Meeting 7:

Date: 1/June/2023
Topic: Discussions of raised issues regarding the compatibility of parts with other parts and resolution through modifications.

Meeting 8:

Date: 4/June/2023
Topic: Finalising the dimensions of all the parts and starting to make dimensioned sketches.

Meeting 9:

Date: 7/June/2023
Topic: Report making and verification.

Work Distribution

PROPOSAL:

1. Documentation and compilation work: Srivibhav, Bhavik, Atharva Bodhale
2. Model Introduction: Srivibhav, Mamta
3. Sketches: All team members made assigned sketches
4. Final editing: Bhoumik, Astitva, Shivraj, Jay, Dhiraj
5. Hardcopy printout: Astitva, Bhoumik, Bhavik

Report:

1. Documentation and compilation work: Bhoumik, Srivibhav, Bhavik, Astitva
2. Modifications: Bhoumik, Astitva, Atharva Dapse
3. Sketches: All team members made assigned sketches
4. Meeting minutes: Srivibhav
5. Work distribution writeup: Astitva, Bhoumik, Srivibhav
6. Final Editing: Astitva, Bhavik, Bhoumik, Srivibhav
7. Hardcopy printout : Bhavik, Astitva, Bhoumik