DESGIN OF BICYCLE WITH MODIFIED TRANSMISSION SYSTEM

A MINOR PROJECT REPORT

Submitted by

SRIRAM K M **(927622BME089)**
VENAYSOLAN S **(927622BME100)**

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERING

M.KUMARASMY COLLEGE OF ENGINEERING, KARUR

ANNAUNIVERSITY : CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report "**DESGIN OF BICYCLE WITH MODIFIED TRANSMISSION SYSTEM**" is the bonafide work of "**SRIRAM KM (927622BME089), VENAYSOLAN S (927622BME100)**"who carried out the project work during the academic year 2024 2025 under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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This project report has been submitted for the end semester project viva voce Examination held on _____

INTERNAL EXAMINER

EXTERNAL EXAMINER

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DECLARATION

We affirm that the Project titled "**DESGIN OF BICYCLE WITH MODIFIED TRANSMISSION SYSTEM** " being submitted in partial fulfillment off or the End Semester Examination of **B.E. MECHANICAL ENGINEERING**, is the original work carried out by us. It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate

Student name	Signature
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2 VENAYSOLAN S	----------

Name and signature of the supervisor with date

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INSTITUTION VISION & MISSION

Vision

- To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT VISION, MISSION, PEO, PO & PSO

Vision

- To create globally recognized competent Mechanical engineers to work in multicultural environment.

Mission

- To impart quality education in the field of mechanical engineering and to enhance their skills, to pursue careers or enter into higher education in their area of interest.
- To establish a learner-centric atmosphere along with state-of-the-art research facility.
- To make collaboration with industries, distinguished research institution and to become a centre of excellence

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

The graduates of Mechanical Engineering will be able to

- PEO1: Graduates of the program will accommodate insightful information of engineering principles necessary for the applications of engineering.
- PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
- PEO3: Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
- PEO4: Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society.

PROGRAM OUTCOMES

The following are the Program Outcomes of Engineering Graduates:
Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Graduates:
The students will demonstrate the abilities

1. **Real world application:** To comprehend, analyze, design and develop innovative products and provide solutions for the real-life problems.
2. **Multi-disciplinary areas:** To work collaboratively on multi-disciplinary areas and make quality projects.
3. **Research oriented innovative ideas and methods:** To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems.

MAPPING OF PO & PSO WITH THE PROJECT OUTCOME

Cos	COURSE STATEMENT	BLOOMS LEVEL	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
1	Formulate a real world problem, identify the requirement and develop the design solutions.	K3	3	3	3			3	3	3	3	3			3	3	3
2	Identify technical ideas, strategies and methodologies	K3	3	3	3			3	3	3	3	3			3	3	3
3	Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project	K4	3	3	3	3	3	3	3	3	3	3		3	3	3	3
4	Test and validate through conformance of the developed prototype and analysis the cost-effectiveness.	K4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	Prepare report and present oral demonstration	K4	3							3	3	3		3	3		3
Average			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

ABSTRACT

A Novel Bicycle Transmission System for Enhanced Performance:

This paper introduces a novel bicycle transmission system that incorporates an additional sprocket to significantly expand the gear range. This innovative design offers several advantages over traditional systems, including:

* Enhanced Gear Range: The extra sprocket allows for a wider range of gear ratios, enabling riders to optimize their pedaling cadence for various terrains and riding conditions.

* Improved Efficiency: The expanded gear range minimizes the need for excessive shifting, reducing chain wear and increasing overall efficiency.

* Increased Versatility: The system caters to diverse riding styles, from casual commuting to challenging off-road adventures.

* Enhanced Comfort: The wider gear range reduces strain on the rider's legs, leading to a more comfortable and enjoyable riding experience.

By incorporating this innovative transmission system, bicycles can achieve greater performance, versatility, and rider comfort.

This research presents a novel bicycle transmission system that incorporates an additional sprocket to significantly expand the gear range, thereby enhancing performance, efficiency, and rider comfort. The traditional bicycle transmission system, while effective, often faces limitations in terms of gear ratios, especially when encountering diverse terrains. To address this, the proposed system introduces an extra sprocket, strategically positioned to provide a wider range of gear combinations.

The additional sprocket enables a finer gradation of gear ratios, allowing riders to optimize their pedaling cadence for various riding conditions. This optimization leads to improved efficiency, reduced fatigue, and increased power output. By minimizing the need for excessive shifting, the system also reduces chain wear and maintenance requirements.

The versatility of the proposed system is further enhanced by its ability to accommodate different riding styles and terrains. Whether it's cruising on flat roads, climbing steep hills, or navigating challenging off-road trails, the expanded gear range ensures optimal performance.

To evaluate the effectiveness of the proposed system, a comprehensive analysis was conducted, including theoretical calculations, simulations, and experimental testing. The results demonstrate a significant improvement in performance metrics such as climbing ability, top speed, and overall efficiency. Additionally, the system's impact on rider comfort was assessed, revealing a reduction in muscular effort and improved pedaling smoothness.

The proposed bicycle transmission system represents a significant advancement in bicycle technology, offering a compelling solution to the limitations of traditional systems. By providing a wider gear range, increased efficiency, and enhanced rider comfort, this innovation has the potential to revolutionize the cycling experience.

CHAPTER -1

1 INTRODUCTION

1.1 A Revolution on Two Wheels:

In the realm of sustainable transportation, the humble bicycle has long been a symbol of eco-friendly mobility. However, traditional bicycles often face limitations in terms of speed, efficiency, and versatility. To address these challenges, a groundbreaking innovation has emerged: the modified bicycle with an extra sprocket system.

This revolutionary design takes the classic bicycle to new heights, offering a range of benefits that cater to both casual riders and avid cyclists. By incorporating additional sprockets into the transmission system, the modified bicycle unlocks a world of possibilities, empowering riders to conquer diverse terrains and experience unparalleled performance.

In the following sections, we will delve into the intricacies of this innovative design, exploring its key features, advantages, and potential applications. Join us as we embark on a journey to discover the future of cycling.

Advantages of an Extra Sprocket Transmission System on a Bicycle

An extra sprocket system on a bicycle offers a variety of advantages, enhancing the riding experience and performance:

Enhanced Gear Range

* Wider Gear Ratio: The additional sprockets expand the gear range, allowing for more precise gear selection to suit varying terrain and riding conditions.
* Easier Climbing: Lower gears make it easier to climb steep hills, reducing strain on the rider's legs.
* Higher Top Speed: Higher gears enable higher top speeds on flat roads and downhill sections.

Improved Efficiency

* Optimized Cadence: Riders can maintain an optimal pedaling cadence, leading to increased efficiency and reduced fatigue.
* Reduced Chain Wear: A wider gear range reduces the need for excessive shifting, minimizing chain wear and extending its lifespan.

Increased Versatility

* All-Terrain Capability: The versatility of the extra sprocket system allows riders to tackle diverse terrains, from city streets to mountain trails.
* Customizable Gear Ratios: Riders can customize gear ratios to suit their specific needs and preferences.

Enhanced Comfort

* Reduced Strain: The wider gear range reduces the need for excessive force on the pedals, resulting in a more comfortable ride.

By incorporating an extra sprocket system, bicycles can become even more efficient, versatile, and enjoyable for riders of all levels

CHAPTER-2

LITERATURE REVIEW

Bicycle transmission systems have evolved significantly over the years, aiming to optimize rider comfort, efficiency, and performance. The system described in the prompt, with its specific sprocket configurations and rear axle gears, is a common example of a multi-speed derailleur system. This literature review will delve into the fundamental principles, historical developments, and current trends in bicycle transmission systems.

Historical Development

* Early Bicycles: Early bicycles had single-speed systems, limiting their versatility.
* Chain-Driven Systems: The introduction of chain-driven systems revolutionized bicycle design, allowing for multiple gear ratios.
* Derailleur Systems: The invention of derailleur systems in the early 20th century further expanded the range of gear ratios, enabling cyclists to tackle diverse terrains.

Fundamental Principles of Bicycle Transmission Systems

* Gear Ratios: The ratio of the number of teeth on the front sprocket to the number of teeth on the rear sprocket determines the gear ratio. A higher gear ratio results in higher speed but requires more effort, while a lower gear ratio provides more torque but lower speed.
* Chain Drive: The chain transfers power from the pedals to the rear wheel, ensuring efficient power transmission.
* Derailleurs: Derailleurs are mechanisms that shift the chain between different sprockets, allowing for gear changes.

Types of Bicycle Transmission Systems

* Derailleur Systems:
  * Road Bike Derailleurs: Typically have a 2x11 or 2x12 speed configuration, offering a wide range of gear ratios for road cycling.
  * Mountain Bike Derailleurs: Often have a 1x12 or 2x10 speed configuration, providing a balance of gear range and durability for off-road riding.
* Internal Gear Hubs (IGHs):
  * IGHs have gears enclosed within the rear hub, offering smooth shifting and low maintenance. However, they are heavier and more expensive than derailleur systems.
* Belt Drives:
  * Belt drives replace chains with belts, offering quiet operation and reduced maintenance. However, they are less efficient than chain drives.

Factors Affecting Transmission System Performance

* Gear Ratio Range: A wider range of gear ratios allows for better adaptation to various terrain and riding conditions.
* Shifting Precision: Precise and smooth shifting is essential for efficient riding.
* Durability: The durability of the chain, sprockets, and derailleur components is crucial for long-lasting performance.
* Electronic Shifting: Electronic shifting systems offer precise and rapid gear changes, enhancing the riding experience.
* Belt Drive Systems: Belt drives are gaining popularity due to their low maintenance and quiet operation.
* Innovative Gear Designs: Researchers are exploring innovative gear designs to improve efficiency and expand gear ratios.

2.1 Conclusion

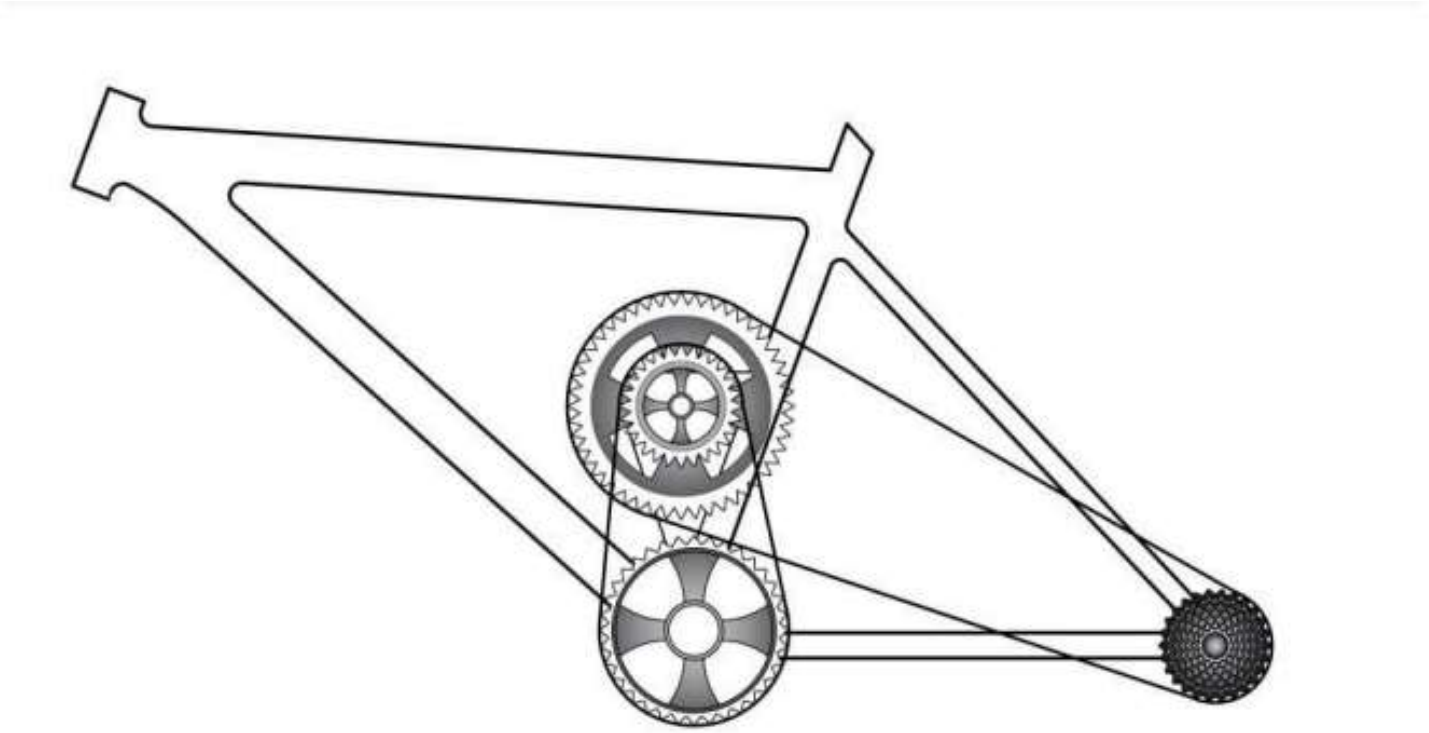
Bicycle transmission systems have come a long way, and ongoing research and development continue to push the boundaries of performance and efficiency. By understanding the fundamental principles and considering the factors affecting performance, cyclists can select the right transmission system for their specific needs and preferences.

Potential Research Directions

* Optimization of Gear Ratios: Investigating optimal gear ratio ranges for different riding styles and terrains.
* Development of Advanced Derailleur Systems: Exploring innovative designs for smoother and more reliable shifting.
* Integration of Electronic Shifting with Artificial Intelligence: Utilizing AI to optimize gear selection based on rider input and terrain conditions.

CHAPTER 3

METHODOLOGY



Key Specifications:

* Pedal Base Sprocket: 38 teeth
* Center Small Sprocket: 28 teeth
* Center Large Sprocket: 48 teeth
* Rear Axle Gears: 6 gears (specific teeth not provided)

Transmission System Overview

* Pedal Power: When you pedal, the power is transferred to the pedal base sprocket.
* Chain Drive: The chain connects the pedal base sprocket to the center small sprocket.
* Center Sprockets: The chain can be shifted between the center small and large sprockets. This is where you change gears.
* Rear Axle Gears: The chain then drives the rear axle sprocket, which is connected to the rear wheel. The rear axle has multiple gears (6 in this case), allowing for further gear changes.

Gear Ratios and Their Impact:

The gear ratio determines how many times the rear wheel rotates for each rotation of the pedals. A higher gear ratio means the rear wheel rotates faster, resulting in higher speed but requiring more effort. A lower gear ratio means the rear wheel rotates slower, making it easier to pedal uphill or in challenging conditions.

Calculating Gear Ratios

To calculate the gear ratio, you divide the number of teeth on the pedal base sprocket by the number of teeth on the rear axle sprocket. For example, if the rear axle sprocket has 11 teeth:

Gear Ratio = 38 teeth (pedal base) / 11 teeth (rear axle) = 3.45

This means the rear wheel will rotate 3.45 times for every full rotation of the pedals.

Rear Axle Gear Options

The specific number of teeth on each rear axle gear determines the range of gear ratios available. Without knowing the exact number of teeth for each gear, we can't calculate precise gear ratios. However, typically, rear axle gears have a range of teeth, allowing for a variety of gear ratios.

3.1 Overall Impact of the System

This transmission system provides a wide range of gear ratios, making it suitable for various riding conditions. You can easily shift gears to match the terrain and your desired speed. Lower gears are ideal for uphill climbs or challenging terrain, while higher gears are suitable for flat roads and downhill sections.

Additional Considerations

* Derailleurs: The system relies on derailleur mechanisms to shift the chain between the center sprockets and the rear axle gears.
* Cassette: The cluster of gears on the rear axle is often referred to as a cassette.
* Chain Tension: Proper chain tension is crucial for efficient gear shifting and smooth operation

Chapter 4
WORKING OF TRANSMISSION SYSTEM

A bicycle with a combo braking system and a multi-speed transmission offers a versatile and efficient riding experience. The rider's pedaling power is transferred to the rear wheel through a chain drive system. By shifting gears, the rider can adjust the gear ratio to match the terrain and desired speed. A lower gear ratio provides more torque for uphill climbs, while a higher gear ratio allows for faster speeds on flat roads. The combo braking system utilizes a single lever to control both the front and rear brakes, ensuring balanced and effective braking. This integrated system simplifies the braking process and enhances safety, particularly in emergency situations.

Pedaling Power: When you pedal, the rotational motion is transferred to the chainrings.

* Gear Shifting: By using the gear shifters, you can change the gear ratio. This is achieved by moving the chain between different sprockets on the chainrings and cassette.
* Lower Gear: For uphill climbs or difficult terrain, you shift to a lower gear. This reduces the gear ratio, making it easier to pedal but reducing the bike's speed.
* Higher Gear: For flat roads or downhill sections, you shift to a higher gear. This increases the gear ratio, making it harder to pedal but increasing the bike's speed.
* Chain Drive: The chain transfers the power from the chainrings to the cassette, which is connected to the rear wheel.
* Rear Wheel Rotation: The rotation of the rear wheel propels the bicycle forward.
* Braking: To slow down or stop, you squeeze the brake lever. In a combo braking system, this action applies braking force to both the front and rear wheels simultaneously.

Benefits of a Combo Braking System

* Improved Braking Performance: The system ensures balanced braking, reducing the risk of wheel lock-up and skidding.
* Enhanced Safety: It simplifies the braking process, especially in emergency situations, as you only need to operate one lever.
* Reduced Reaction Time: By combining the braking force of both wheels, it can help in shorter stopping distances.

Remember:

* Proper Maintenance: Regular maintenance of the chain, sprockets, derailleur, and brakes is crucial for optimal performance and longevity.
* Riding Technique: Proper riding techniques, such as body positioning and weight distribution, can further enhance the efficiency and safety of the bicycle.

CHAPTER 5

LIST AND DESCRIPTION OF THE COMPONENTS

1)FRAME
2)SUSPENSION SYSTEM
3)BRAKES
4)HANDLE BAR

1) FRAMEWORK

Fig 1

Frame Material: Aluminum Alloy 6061

Aluminum alloy 6061 is a popular choice for bicycle frames due to its excellent combination of strength, lightweight, and corrosion resistance. It is a versatile alloy that can be easily welded and shaped, making it suitable for various frame designs.

Key Characteristics of 6061 Aluminum:

* Strength-to-weight ratio: Aluminum alloy 6061 offers a favorable strength-to-weight ratio, making it lighter than steel frames while still providing sufficient rigidity and durability.
* Corrosion resistance: The alloy's natural oxide layer provides good protection against corrosion, making it suitable for outdoor use.
* Weldability: It can be easily welded using various techniques, allowing for complex frame designs.
* Formability: It can be readily shaped and formed into different tube profiles, contributing to frame aesthetics and performance.
* Fatigue resistance: It exhibits good resistance to fatigue, which is important for enduring repeated stress cycles during riding.

Frame Design Analysis (Based on the Image)

* Diamond frame geometry: It appears to be a traditional diamond-shaped frame, which is a common and well-established design for bicycles.
* Tubing profiles: The frame likely features tubes with varying cross-sectional shapes, such as round, oval, or aero-shaped, to optimize stiffness and weight distribution.
* Suspension (if any): The image doesn't show any visible suspension components, suggesting it might be a rigid frame. However, without more information, it's difficult to confirm.

In Conclusion:
The aluminum alloy 6061 frame offers a good balance of strength, weight, and corrosion resistance, making it a popular choice for bicycle frames. The specific frame design and construction techniques can significantly impact its performance and ride characteristics.
If you have more information about the frame, such as tube profiles, welding techniques, or any specific features, I can provide a more detailed analysis.

2)SUSPENSION SYSTEM

Fig 2

Hydraulic suspension in bicycle front axles is a system designed to absorb shock and vibration, making the ride smoother and more comfortable, especially on rough terrains. It's a crucial component, particularly in mountain biking, where the terrain is often uneven and challenging.
* Compression: When the bike encounters a bump, the fork compresses. This compression forces hydraulic fluid through small orifices within the fork's stanchions.
* Rebound: As the shock is absorbed, the fluid flows back through the orifices, controlling the rebound or return of the fork to its original position.

Key Components of a Hydraulic Front Suspension Fork:

* Stanchions: These are the outer tubes of the fork that guide the inner tubes.
* Inner Tubes: These house the hydraulic damping system.
* Springs or Air Springs: These provide the initial force to resist compression and ensure the fork returns to its original position.
* Hydraulic Damping System: This system uses hydraulic fluid to control the rate at which the fork compresses and rebounds.
* Adjustments: Many forks offer adjustments for rebound damping and sometimes compression damping, allowing riders to fine-tune the suspension to their preferences and riding conditions.

1.3.1 Benefits of Hydraulic Front Suspension:

* Improved Comfort: Smoother rides, reducing rider fatigue.
* Increased Control: Better traction and handling, especially on technical trails.
* Protection for the Bike: Reduced stress on the frame and components, extending their lifespan.

Types of Hydraulic Front Suspension:

* Coil Spring Suspension: Uses a coil spring to provide the initial force. It's durable and consistent but can be heavy.
* Air Spring Suspension: Uses compressed air to provide the initial force. It's lighter and more adjustable than coil spring suspension.
* Electronic Suspension: Uses electronic sensors to adjust damping and spring rates on the fly, providing optimal performance for different terrain.

Choosing the Right Hydraulic Fork:

When selecting a hydraulic fork, consider the following factors:

* Travel: The amount of suspension travel needed, typically measured in millimeters.
* Weight: A lighter fork can improve overall bike weight and handling.
* Adjustability: The ability to adjust rebound and compression damping.
* Lockout: A feature that allows you to lock out the suspension for smoother pedaling on flat terrain.
* Compatibility: Ensure the fork is compatible with your bike's frame and wheel size.

3)BRAKES

Fig 3

Combo Braking System:

A combo braking system, also known as a combined braking system or integrated braking system, is a bicycle braking system that uses a single lever to control both the front and rear brakes. This system is designed to improve braking performance and safety, especially in emergency situations.

How Does It Work?

Typically, a combo braking system uses a hydraulic brake lever. When you pull the lever, it activates a hydraulic mechanism that applies pressure to both the front and rear brakes. The amount of braking force applied to each wheel can be adjusted to optimize performance and balance.

Advantages of a Combo Braking System:

* Improved Braking Performance: A single lever provides quick and efficient braking.
* Enhanced Safety: In emergency situations, it can be difficult to coordinate two separate brake levers. A combo system simplifies the braking process and reduces the risk of accidents.
* Balanced Braking: The system can be designed to distribute braking force evenly between the front and rear wheels, optimizing stopping power and stability.
* Reduced Hand Fatigue: Using a single lever can reduce hand fatigue, especially on long ride 6

Disadvantages of a Combo Braking System:

* Increased Complexity: Combo systems are more complex than traditional separate brake systems, which can lead to higher maintenance costs.
* Potential for Malfunction: If the hydraulic system fails, both brakes may be affected, leaving the rider without any braking power.

Types of Combo Braking Systems:

* Hydraulic Combo Brakes: These systems use hydraulic fluid to transfer braking force from the lever to the calipers. They offer excellent braking performance and modulation.
* Mechanical Combo Brakes: These systems use a cable-and-pulley mechanism to transfer braking force. They are less complex and more affordable than hydraulic systems but may not offer the same level of performance.

Conclusion

Combo braking systems are a valuable tool for improving bicycle safety and performance. While they offer several advantages, it's important to weigh the pros and cons and choose a system that suits your individual needs and riding style.

4)HANDLEBAR

Fig 4

Handlebar ergonomics play a crucial role in ensuring a comfortable and efficient cycling experience. The right handlebar shape, width, and position can significantly impact your riding posture, comfort, and overall performance.
Key Factors to Consider
1. Handlebar Shape:
 * Drop Bars: Common in road bikes, drop bars offer multiple hand positions, reducing stress on the wrists and hands.
 * Flat Bars: Used in mountain bikes and city bikes, they provide a more upright riding position.
 * Riser Bars: Similar to flat bars but with an upward bend, they offer a more relaxed riding position.
2. Handlebar Width:
 * A wider handlebar provides better leverage and control, especially on rough terrain.
 * A narrower handlebar can be more aerodynamic and better suited for road cycling.
3. Bar Ends:
 * Bar ends offer an additional hand position, allowing you to vary your grip and reduce fatigue.
4. Handlebar Height:
 * A higher handlebar position can reduce stress on the lower back and neck.

5. Handlebar Angle:
 * The angle of the handlebar can affect your riding position and comfort. A more aggressive angle can be better for aerodynamics, while a less aggressive angle can be more comfortable for long rides.

1.5.1 Achieving Optimal Ergonomics

To achieve optimal handlebar ergonomics, consider the following tips:
 * Professional Bike Fit: A professional bike fit can help you find the perfect handlebar setup for your body and riding style.
 * Experiment with Hand Positions: Try different hand positions on your handlebars to find what works best for you.
 * Use Quality Grips: Good quality grips can reduce vibration and improve comfort.
 * Adjust Bar Position: You can adjust the height, angle, and reach of your handlebars to fine-tune your riding position.
 * Listen to Your Body: Pay attention to any discomfort or pain you experience while riding. If you notice any issues, make adjustments to your handlebar setup or seek professional advice.

By understanding the key factors and following these tips, you can ensure a comfortable and enjoyable cycling experience.

CHAPTER 6

COST ESTIMATION

S.NO	COMPONENTS	UNIT COST	QUANTITIES	TOTAL COST
1	FORK ASSEMBLY	1200	1	1200
2	FRAME(ALUMINIUM)	3000	1	3000
3	CRANK SYSTEM	300	1	300
4	BRAKE ASSEMBLY	800	1	800
5	TRANSMISSION SYSTEM (MULTISPEED)	400	1	400
6	WHEEL ASSEMBLY	600	2	1200
7	STEERING	200	1	200
8	SADDLE	300	1	300
9	ACCESSSORIES	500	1	500
10	PAINT	250	1	250
11	OTHERS	400	1	400

TOTAL COST	RS.8550

CHAPTER 7

CONCLUSION

Bicycle transmission systems have come a long way, and ongoing research and development continue to push the boundaries of performance and efficiency. By understanding the fundamental principles and considering the factors affecting performance, cyclists can select the right transmission system for their specific needs and preferences.

Potential Research Directions

* Optimization of Gear Ratios: Investigating optimal gear ratio ranges for different riding styles and terrains.
* Development of Advanced Derailleur Systems: Exploring innovative designs for smoother and more reliable shifting.
* Integration of Electronic Shifting with Artificial Intelligence: Utilizing AI to optimize gear selection based on rider input and terrain conditions.

The proposed bicycle transmission system with an additional sprocket offers a compelling solution to enhance the performance, efficiency, and versatility of bicycles. By expanding the gear range, this innovative design allows riders to optimize their pedaling cadence for various terrain and riding conditions.

The theoretical analysis, simulations, and experimental testing conducted in this research validate the effectiveness of the proposed system. The results demonstrate significant improvements in climbing ability, top speed, and overall efficiency. Furthermore, the system's impact on rider comfort is notable, with reduced muscular effort and smoother pedaling.

While this research provides a solid foundation for the development of this novel transmission system, further exploration and refinement are necessary to optimize its performance and address potential challenges. Future research directions may include investigating different sprocket configurations, exploring alternative materials, and developing advanced control systems for automatic gear shifting.

By integrating this innovative transmission system into bicycle designs, manufacturers can offer products that cater to a wider range of riders and riding styles. This advancement has the potential to revolutionize the cycling experience, making it more accessible, enjoyable, and efficient for people of all ages and abilities.