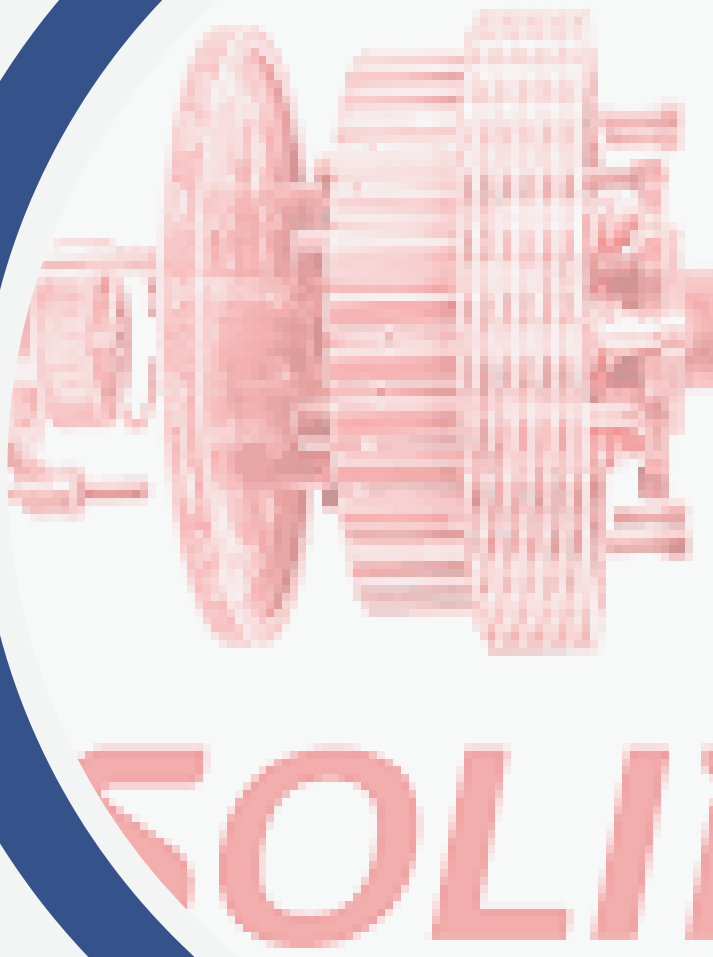
Semester Project

SOLIDWORKS REPORT 2025



Presented By

M. Usman	**241202**
M. Hamza	**241238**
Arsel Kaleem	**241190**
M. Tayyab	**241235**

Table of Content

Group Members:

Names	Roll Numbers
Muhammad Usman Khan	241202
Muhammad Hamza Khalid	241238
Arsel Kaleem Abbasi	241190
Muhammad Tayyab	241235

Abstract:

This report focuses on the 3D design and analysis of a V6 internal combustion engine modeled using SolidWorks software. The engine features six cylinders arranged in a V-configuration, offering a compact yet powerful layout commonly used in modern vehicles. The model highlights essential components such as the pistons, crankshaft, camshafts, intake and exhaust manifolds, and the timing mechanism. Bevel gears are incorporated to transfer rotational motion efficiently, while the transparent valve covers allow clear visualization of the valve train system. The use of SolidWorks enabled precise modeling of the engine's internal structure, allowing for better understanding of its working mechanism and design optimization. This detailed assembly showcases the mechanical coordination between all moving parts, aiming to achieve high performance, durability, and operational efficiency.

Introduction:

The V6 engine is a widely used internal combustion engine configuration known for its balance of performance, compact size, and smooth operation. This report presents a comprehensive 3D model of a V6 engine created using SolidWorks, aimed at understanding its internal structure, working mechanism, and design features. The V6 layout consists of six cylinders arranged in two banks of three cylinders each, forming a 'V' shape—commonly at a 60- or 90-degree angle—which provides a compact yet powerful engine design suitable for a variety of vehicles.

The engine model designed in this project showcases not only the major components such as pistons, crankshaft, camshafts, and exhaust manifolds, but also highlights advanced features like dual overhead camshafts and a gear-driven timing system using bevel gears. These components are carefully integrated to reflect the actual motion and mechanical synchronization that occur during engine operation. Transparent covers are used to allow a clear view of internal components like rocker arms and valves, enhancing the educational value of the model.

SolidWorks has been utilized for its precision and ability to represent complex assemblies, making it ideal for visualizing and simulating the engine's real-life functionality. This introduction sets the stage for a deeper exploration into the design, components, and working principles of the modeled V6 engine.

Purpose:

The purpose of this project is to design and model a V6 engine using SolidWorks to visually demonstrate its internal structure and working mechanism. It aims to help students and engineers understand how components like pistons, crankshaft, and camshafts function together. The model also serves as an educational tool for studying engine motion and assembly without physical disassembly. This project enhances CAD skills and provides practical insight into internal combustion engine design.

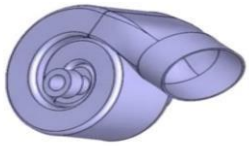
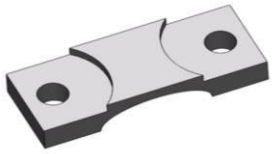
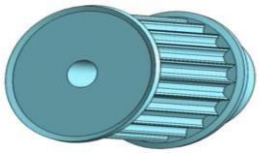
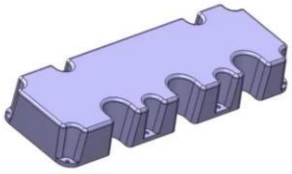
References:

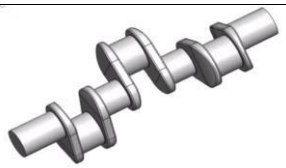
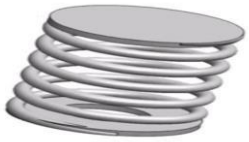
Concept and help for building different parts step by step of a V6 Engine had been taken from the YouTube videos owned by "**CAD tutorial by MahtabAlam**" and Link for Videos Playlist is: https://youtube.com/playlist?list=PLRhna5_X7uWt0EmWcdZU0FLDE1_fAwFoV&si=dUxO8YZFGexQLMMS respectively.

Distribution:

Muhammad Usman Khan	5 Parts 5 layouts Report 25% Assembly Participation 25%
Muhammad Hamza Khalid	5 Parts 5 layouts Report 25% Assembly Participation 25%
Arsel Kaleem Abbasi	5 Parts 5 layouts Report 25% Assembly Participation 25%
Muhammad Tayyab	5 Parts 5 layouts Report 25% Assembly Participation 25%

Bill of materials:

Name of parts	Number of Parts used	Pictures
Engine cylinder head	2	
Exhaust manifold	2	
Turbo housing	2	
Engine side cover	2	
Cam shaft retainer	4	
Belt wheel	2	
Rocker arm	12	
Valve cover	2	

Crank shaft	1	
Backing spring	12	
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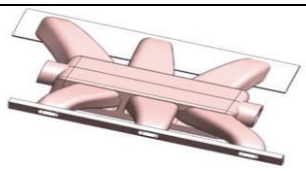
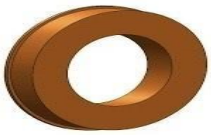
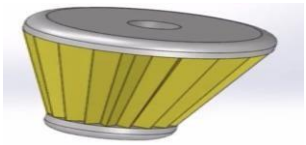
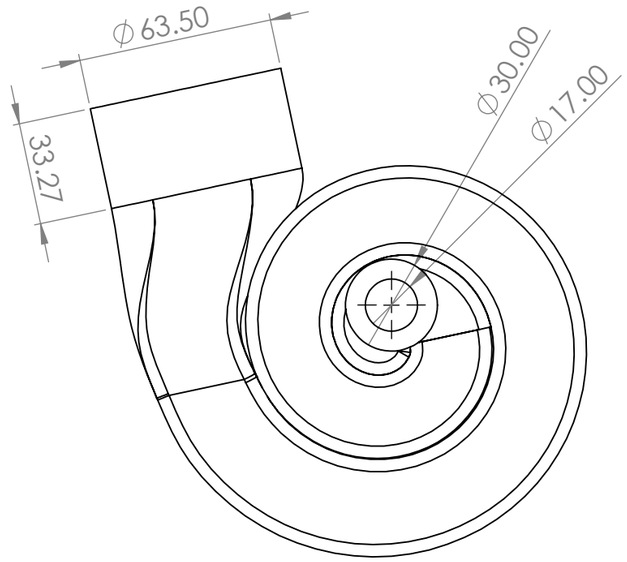
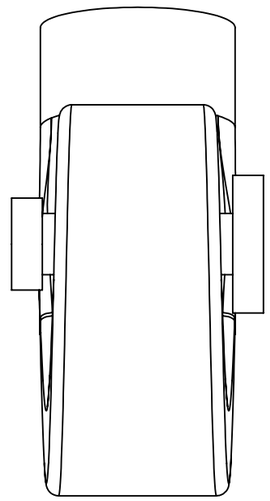
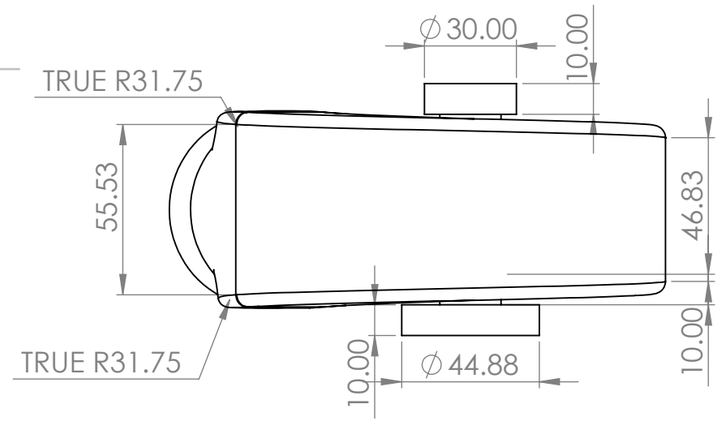
Intake manifold	1	
Engine valve	12	
Piston rod assembly	6	
Bushings	4	
Air filter	2	
Cam shaft	2	

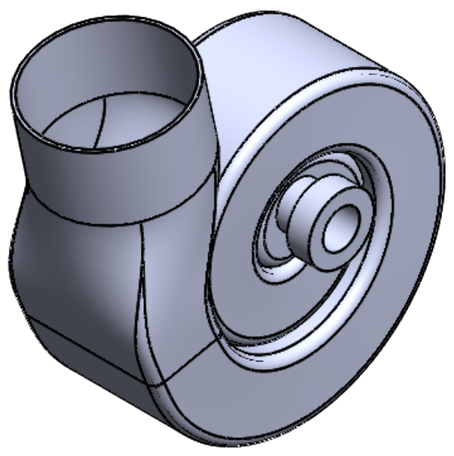
Assembly Tree:

Layouts:







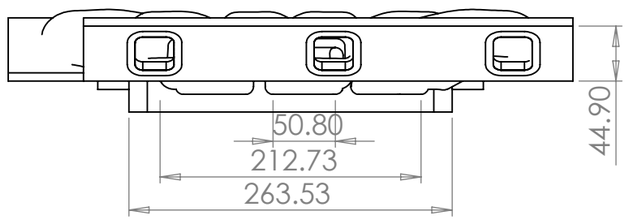


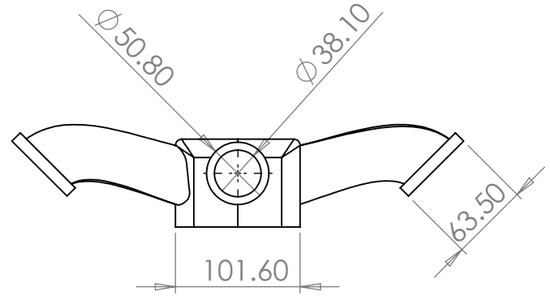
Name	Muhammad Hamza Khalid
Roll No	241238
Scale	1:2
Section	BEME-F-24-B

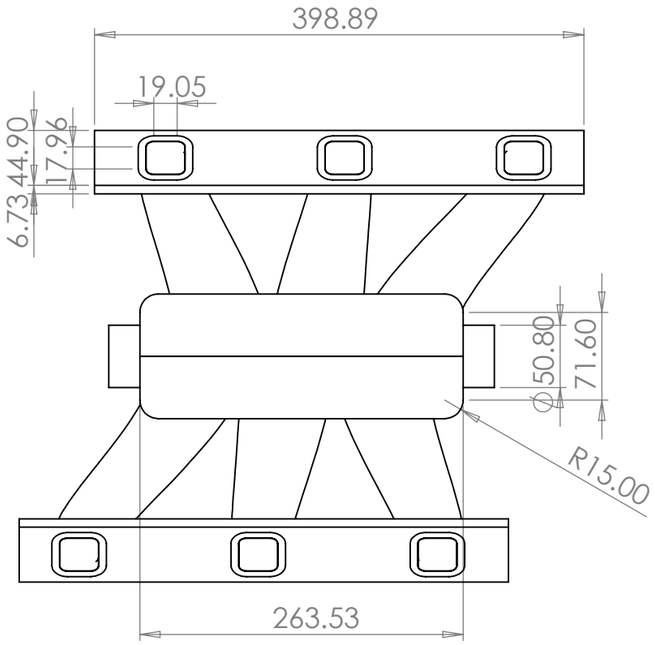
Air Turbo Housing

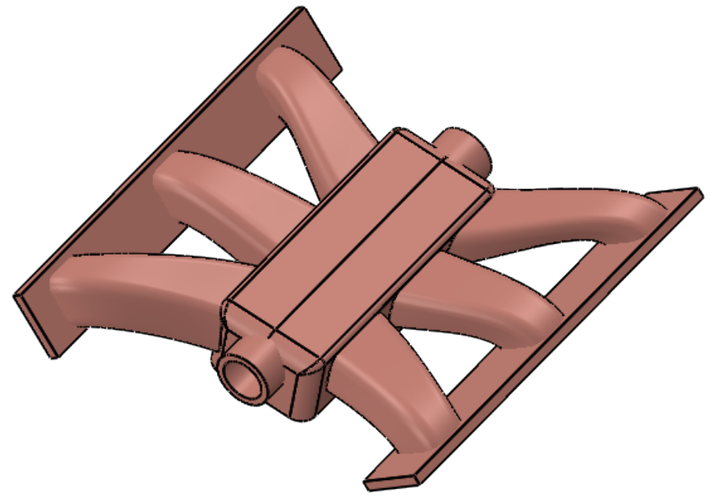
Semester Project Solid works

Submitted to Sir Mehtab Khalid Masih

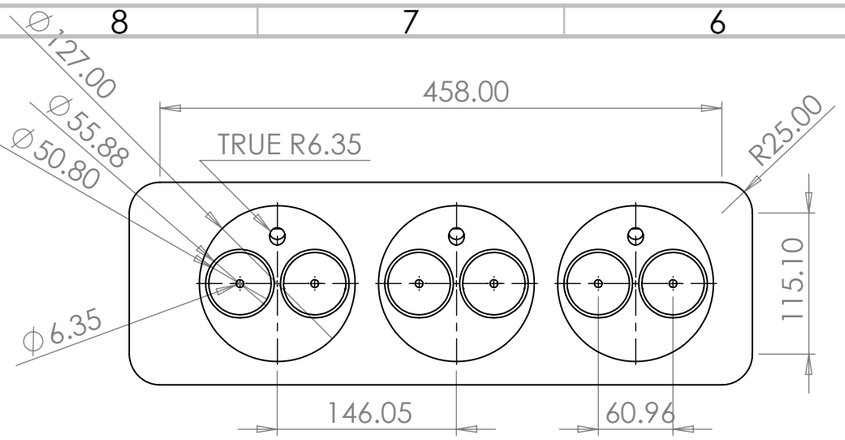


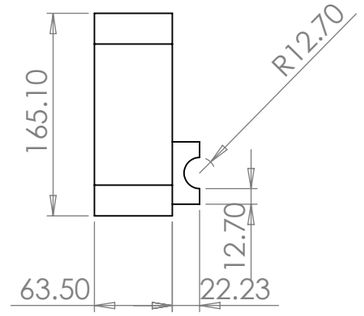


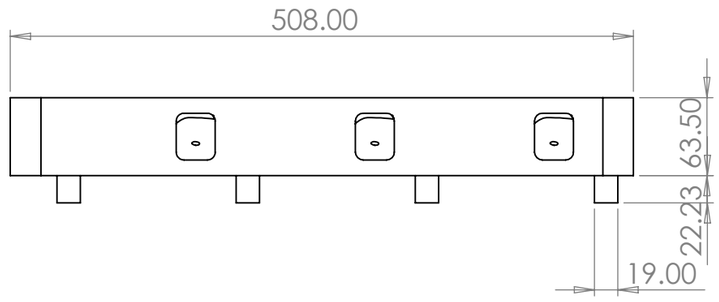


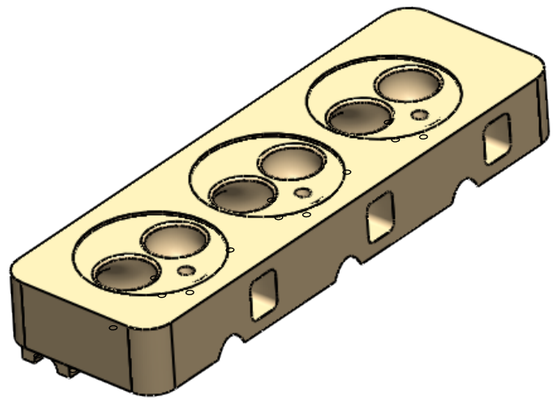


Name	Muhammad Hamza Khalid	Engine Intake Manifold	
Roll No	241238		
Scale	1:5	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih







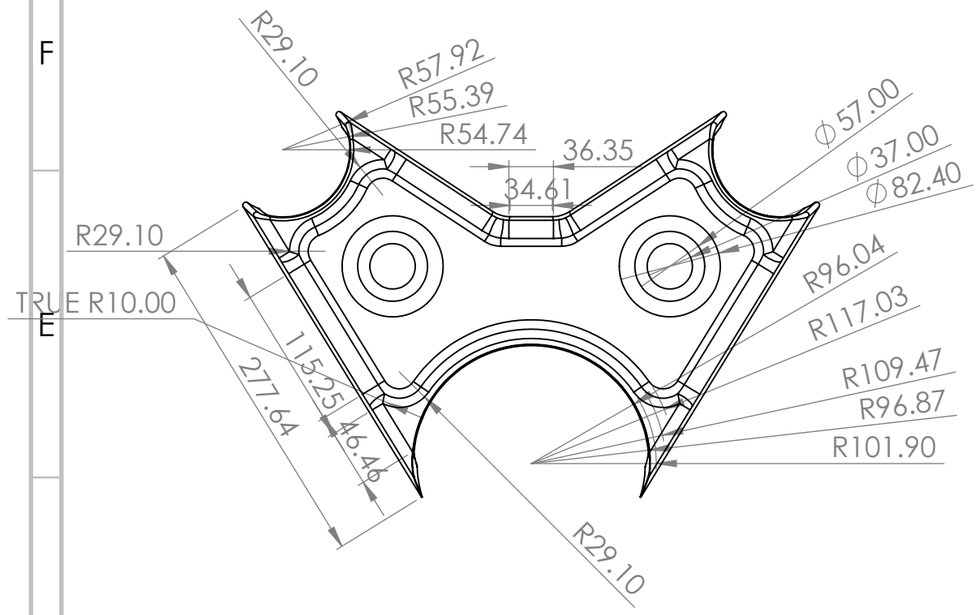


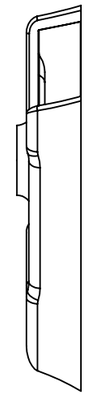
Name	Muhammad Hamza Khalid
Roll No	241238
Scale	1:5
Section	BEME-F-24-b

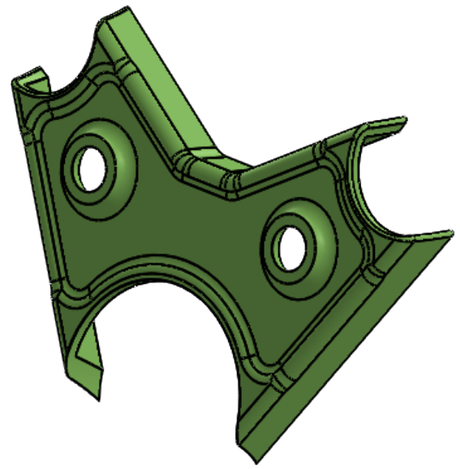
Engine Cylinder Head

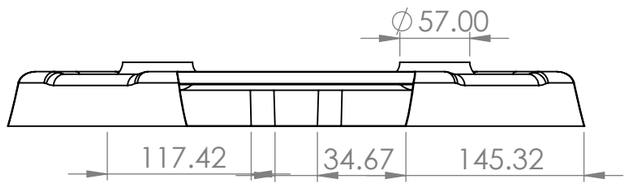
Semester Project Solidworks

Submitted to Sir Mehtab Khalid Masih







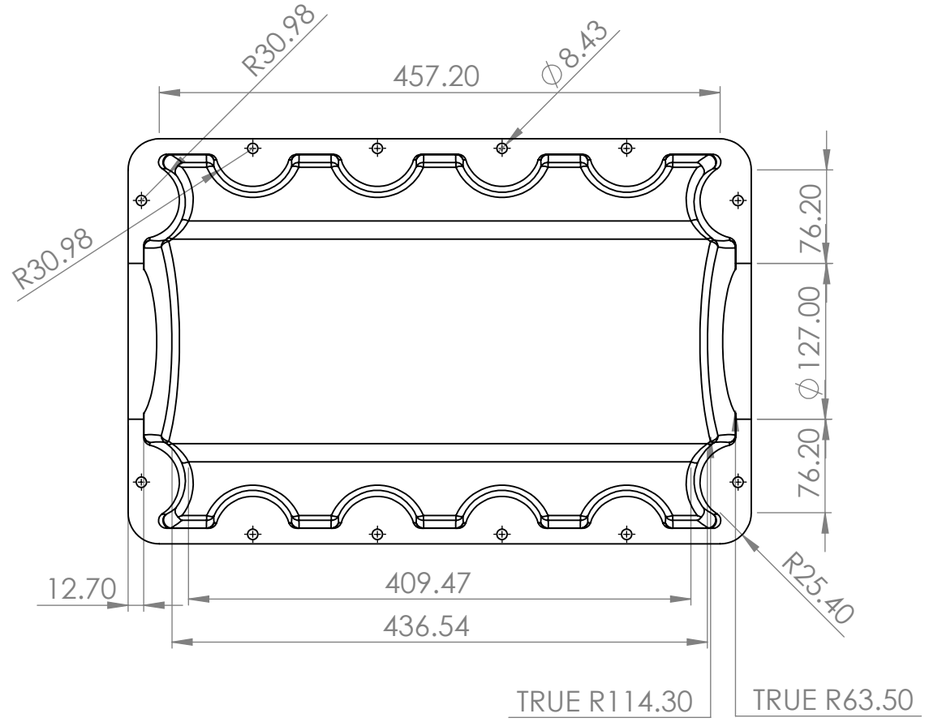


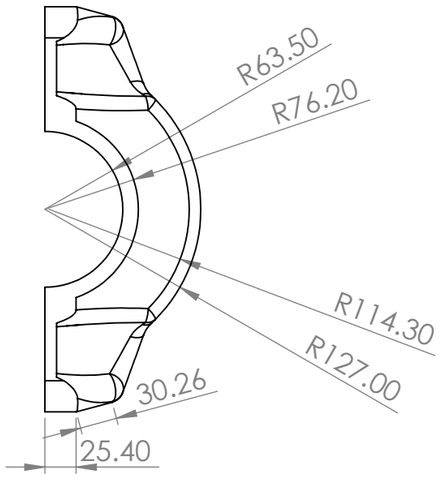
Name	Muhammad Hamza Khalid
Roll No	241238
Scale	1:5
Section	BEME-F-24-B

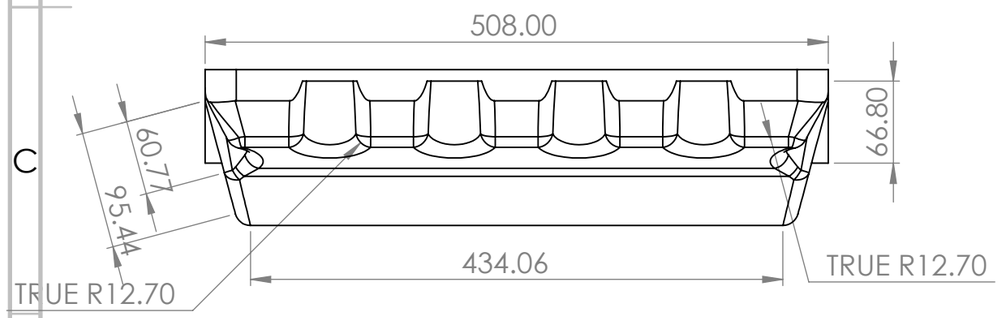
Engine Side Cover

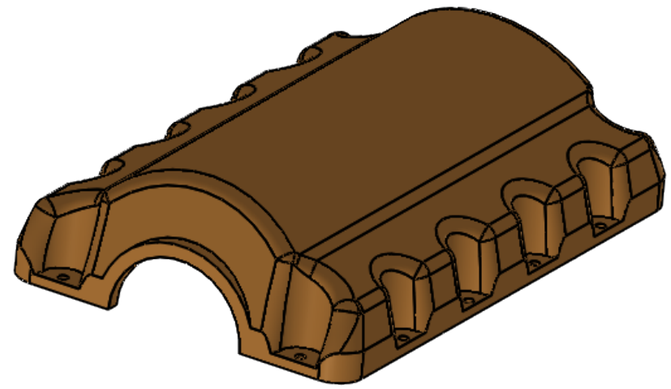
Semester Project Solid works

Submitted to Sir Mehtab khalid Masih

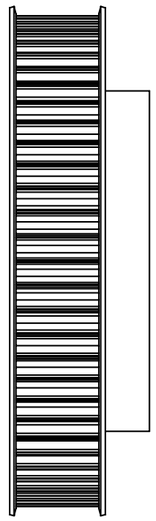


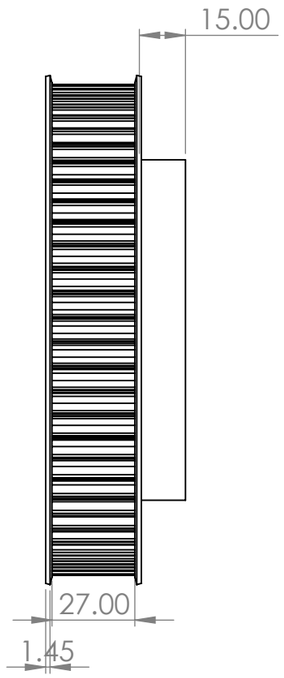


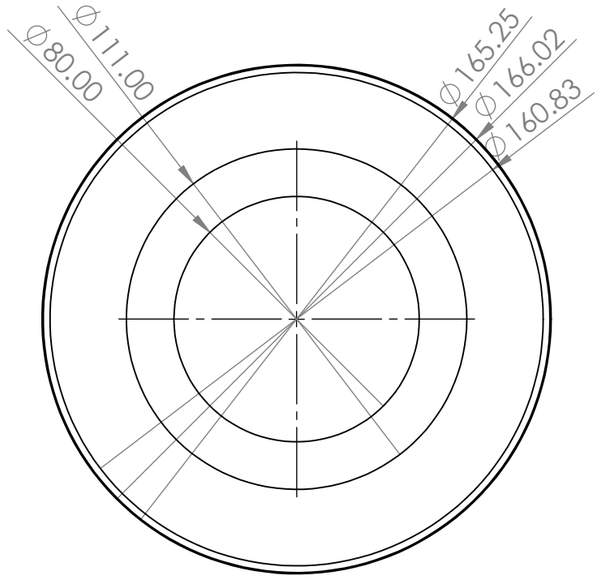


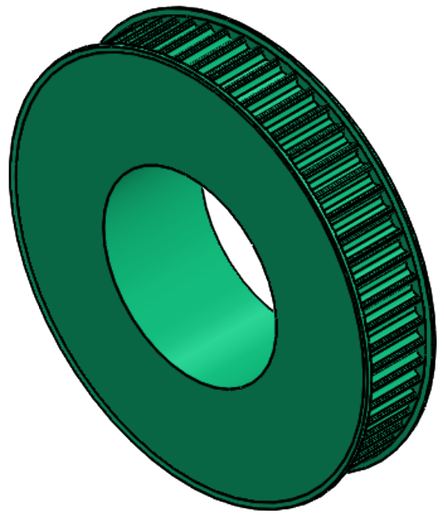


Name	Muhammad Hamza Khalid	Engine Oil Pan	
Roll No	241238		
Scale	1:5	Smester project Solid works	
Section	BEME-F-24-B	Submitted to	Sir Mehtab khalid Masih







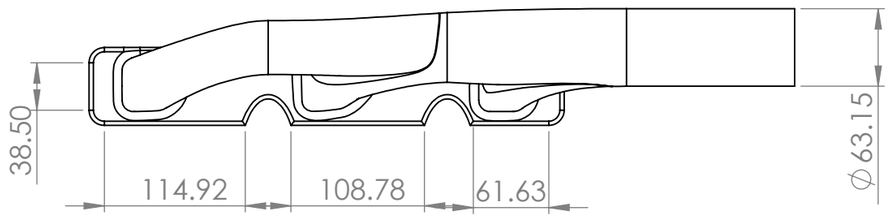


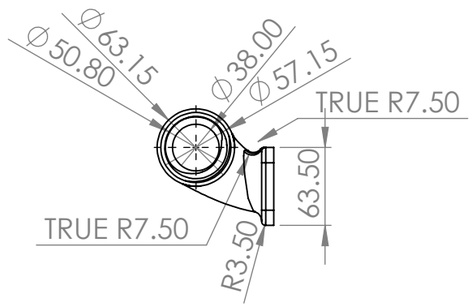
Name	Muhammad Usman Khan
Roll No	241202
Scale	1:2
Section	BEME-F-24-B

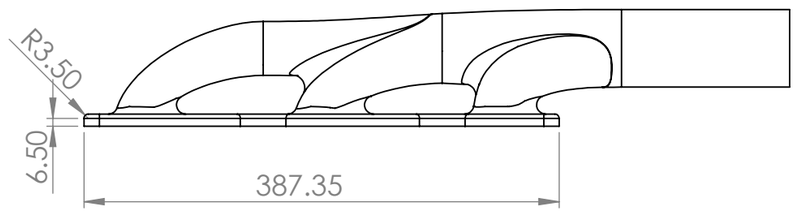
Belt Wheel (Large)

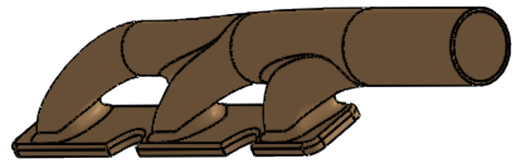
Semester Project Solidworks

Submitted to Sir Mehtab Khalid Masih

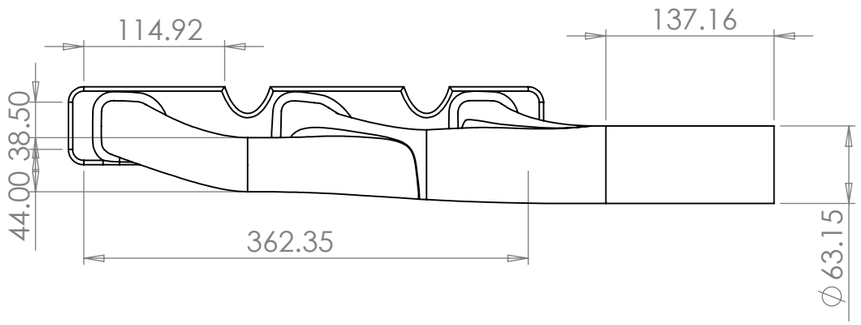


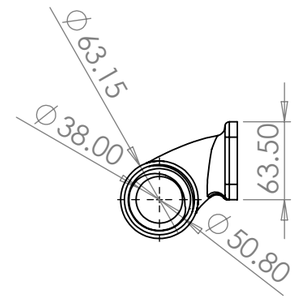


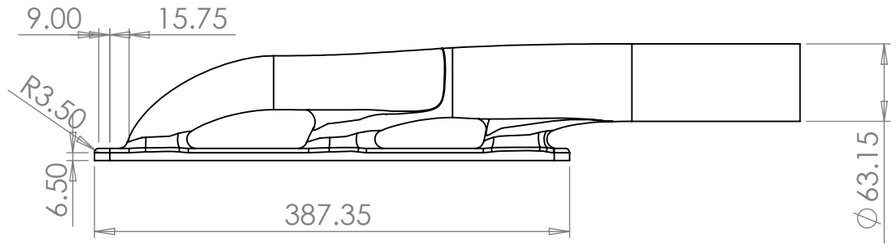


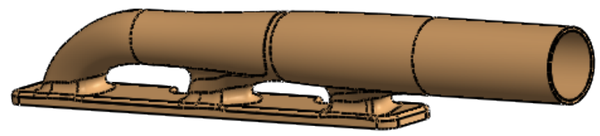


Name	Muhammad Usman Khan	Exhaust Manifold (a)	
Roll no	241202		
Scale	1:5	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab khalid Masih







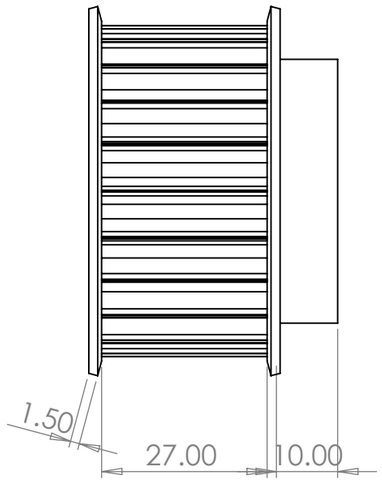


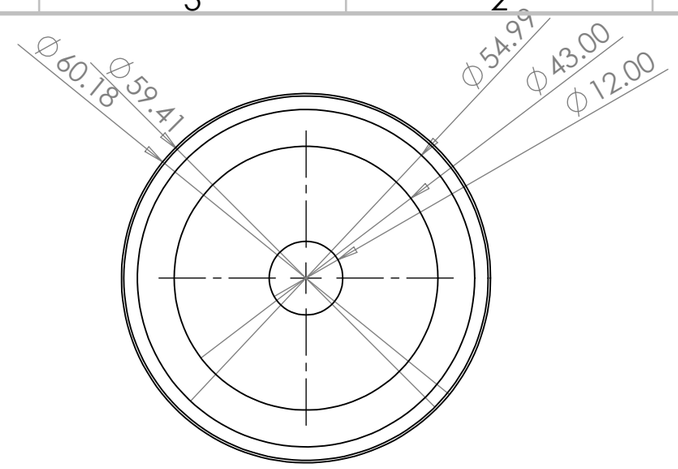
Name	Muhammad Usman Khan
Roll No	241202
Scale	1:5
Section	BEME-F-24-B

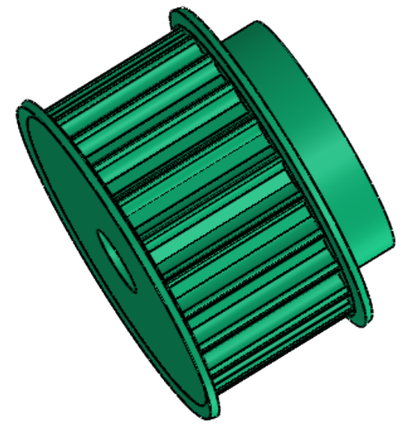
Exhaust Manifold (b)

Semester Project Solidworks

Submitted To	Sir Mehtab Khalid Masih





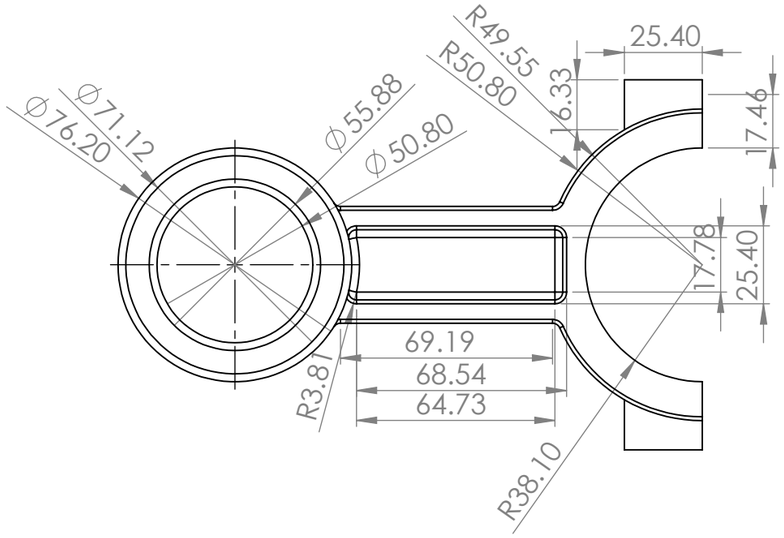


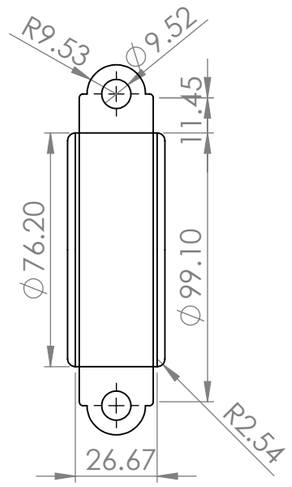
Name	Muhammad Usman Khan
Roll no	241202
Scale	1:1
Section	BEME-F-24-B

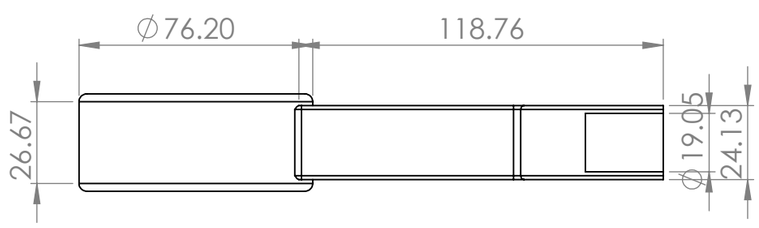
Belt Wheel (Small)

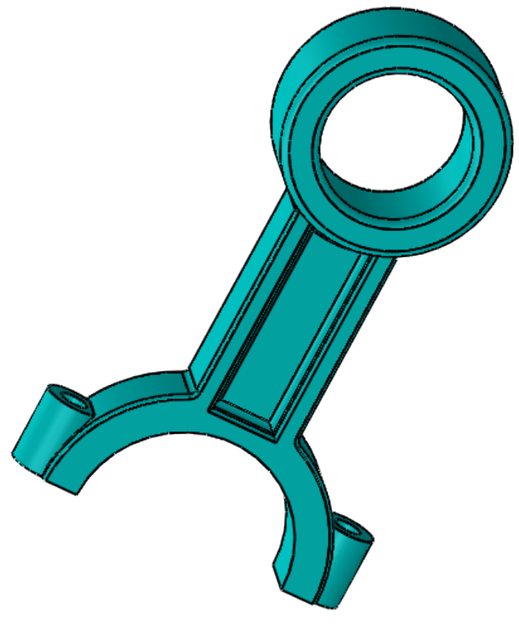
Semester Project Solidworks

Submitted to Sir Mehtab Khalid Masih

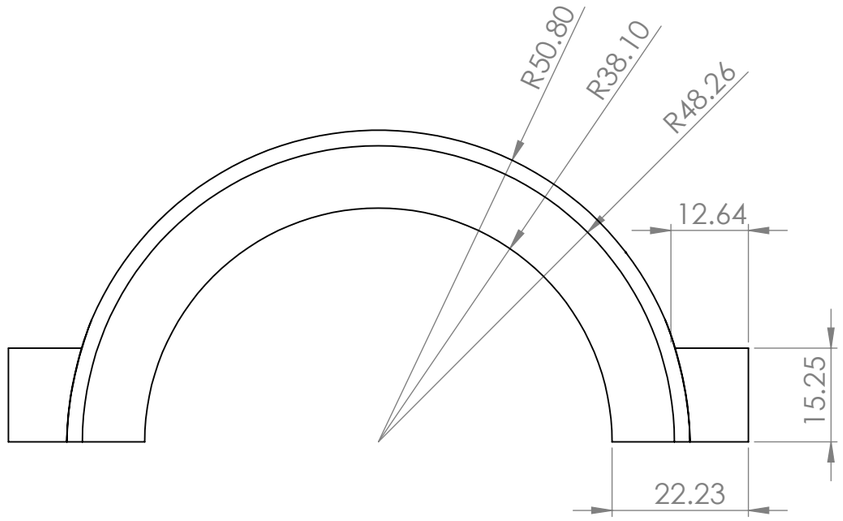


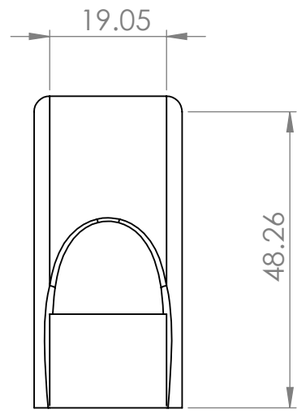


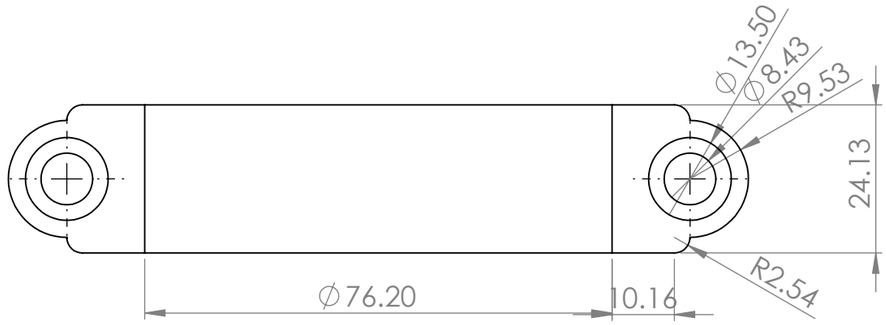


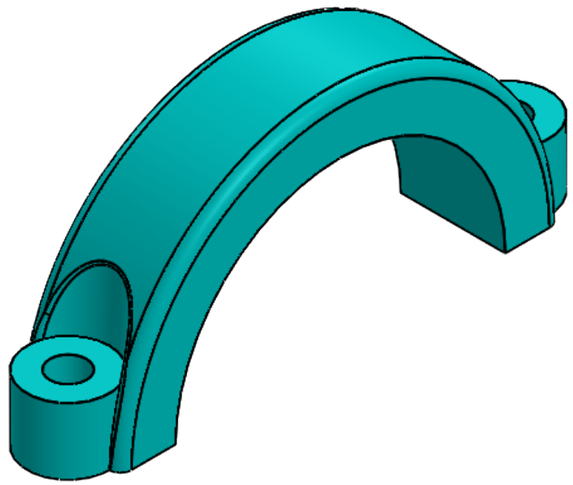


Name	Muhammad Usman khan	Piston Rod (a) connecting rod	
Roll No	241202		
Scale	1:2	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih

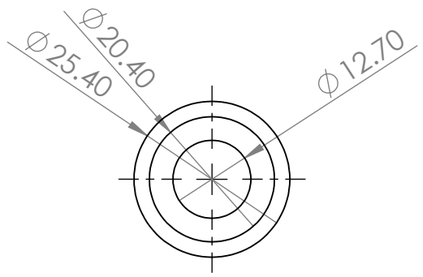


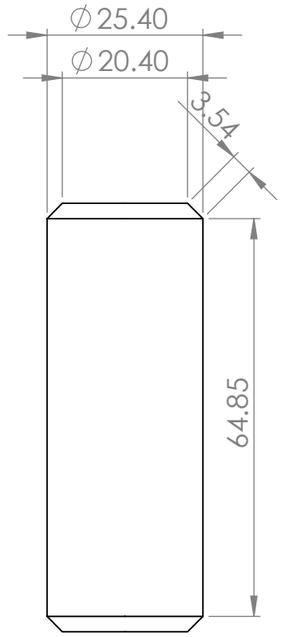


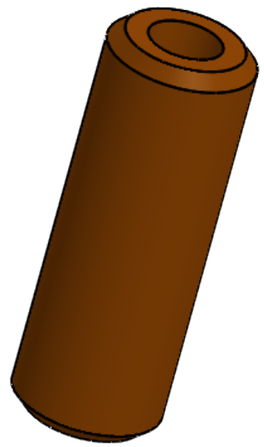




Name	Muhammad Usman Khan	Piston Rod (b) rod cap	
Roll No	241202		
Scale	1:1	Semester project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih





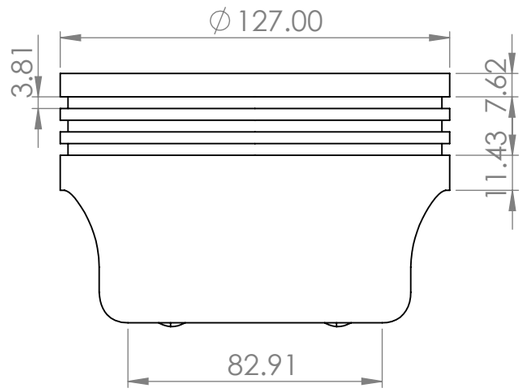


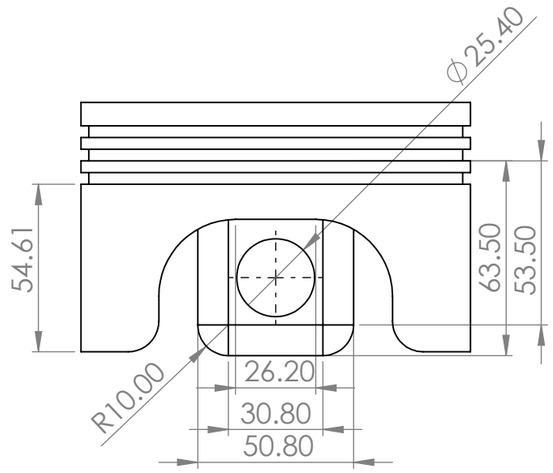
Name	Muhammad Usman Khan
Roll No	241202
Scale	1:1
Section	BEME-F-24-B

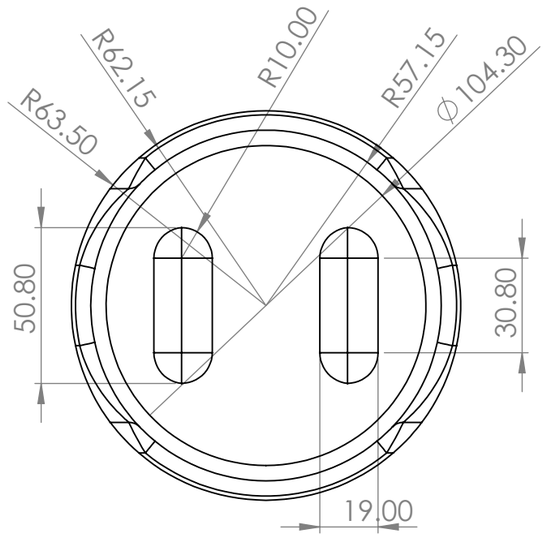
Piston Rod (c) pin

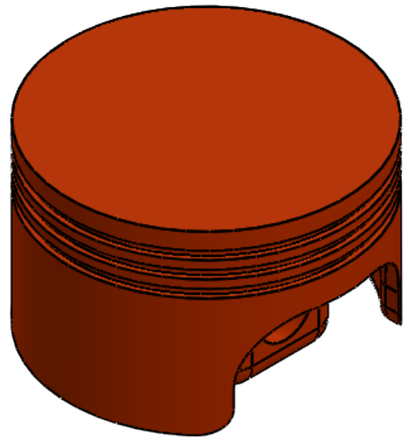
Semester Project Solidworks

Submitted to Sir Mehtab Khalid Masih

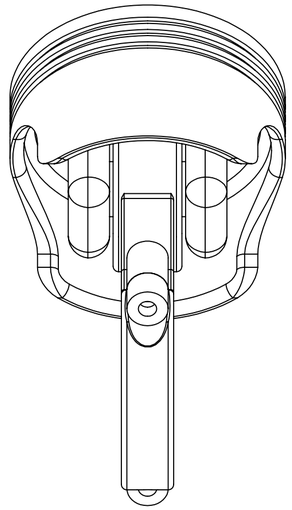


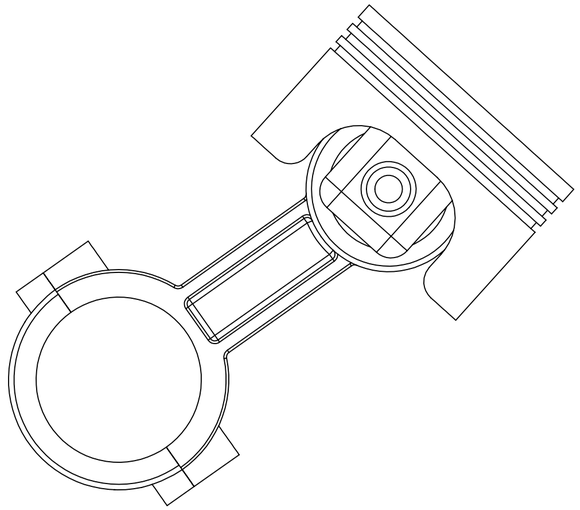


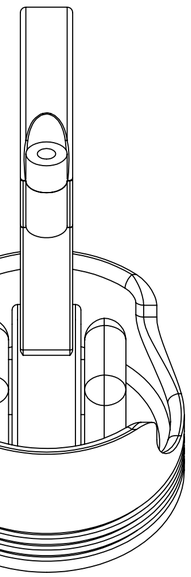


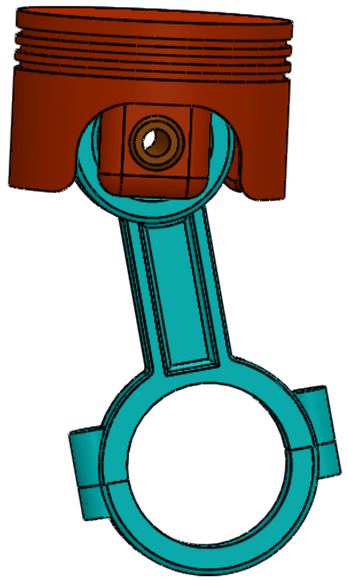


Name	Muhammad Usman Khan	# Piston Rod (d) piston	
Roll No	241202		
Scale	1:2	Smester Project Solidworks	
Section	BEME-F-24-B	Submitted To	Sir Mehtab Khalid Masih







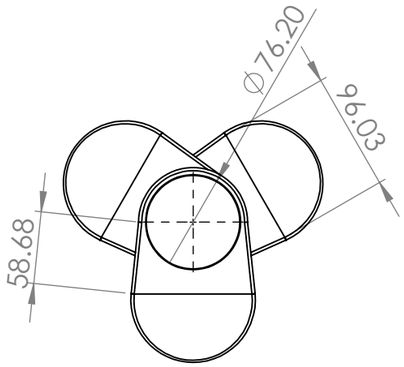


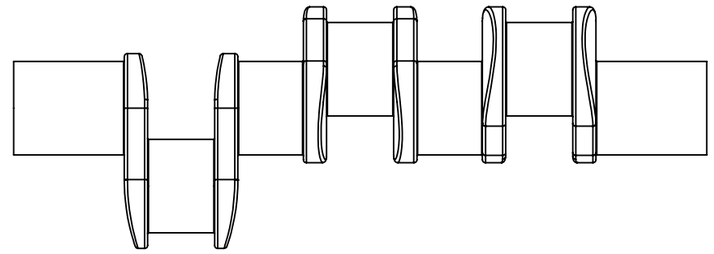
Name	Muhammad Usman Khan
Roll No	241202
Scale	1:1
Section	BEME-F-24-B

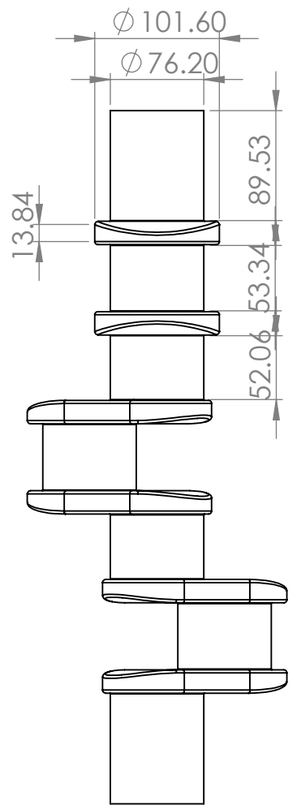
Piston Rod ASSEMBLY

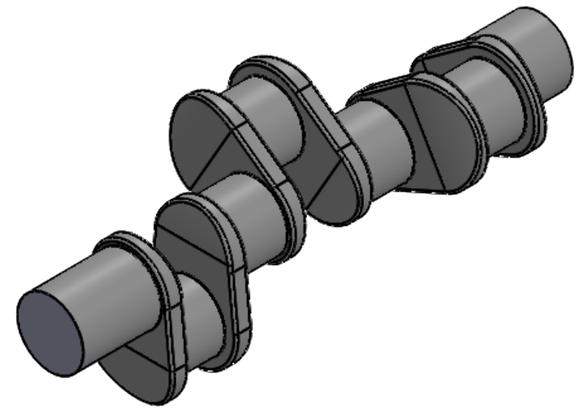
Semester Project Solid works

Submitted to Sir Mehtab khalid Masih

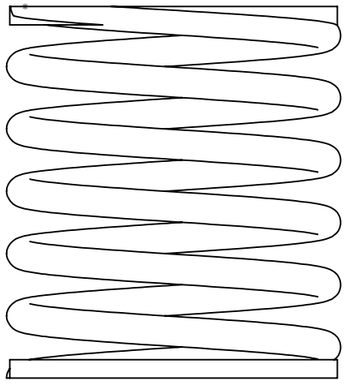


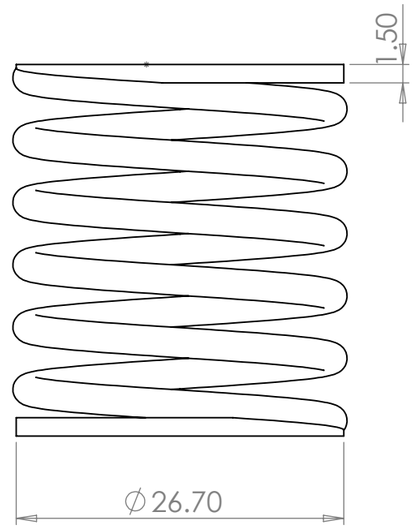


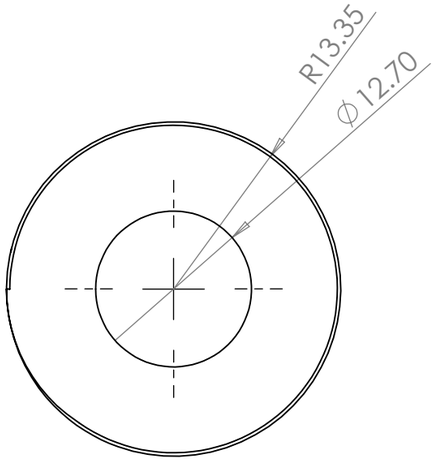


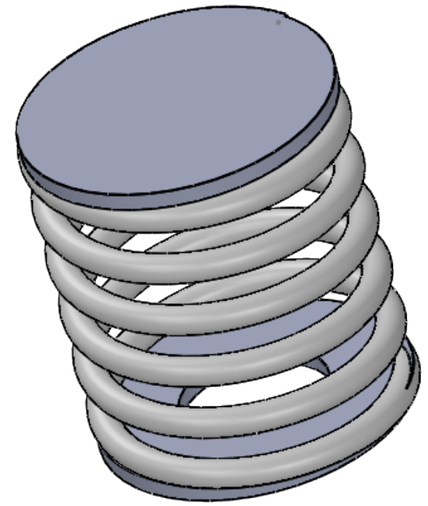


Name	Muhammad Usman khan	CrankShaft	
Roll No	241202		
Scale	1:5	Semester Project Solid Works	
Section	BEME-F-24-B	Submitted To	Sir Mehtab Khalid Masih







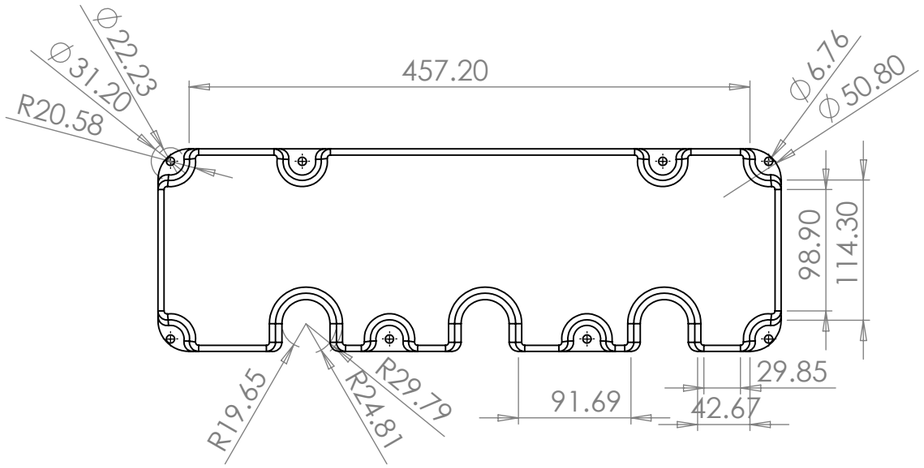


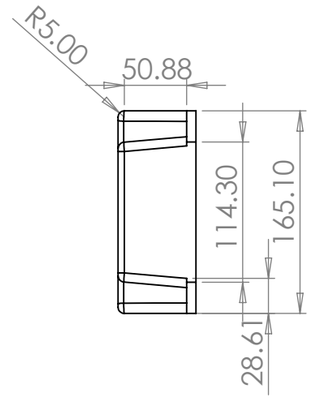
Name	Arsel Kaleem Abbasi
Roll no	241190
Scale	2:1
Section	BEME-F-24-B

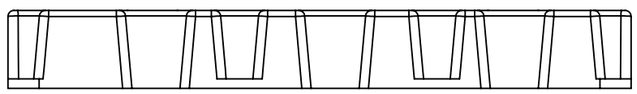
Rocker Arm Backing Spring

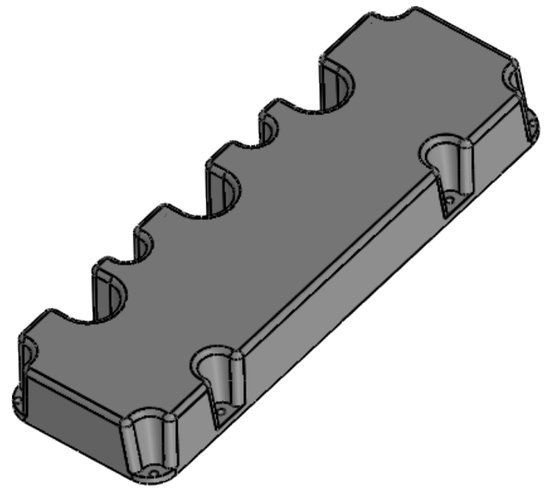
Semester project Solidworks

Submitted to Sir Mehtab Khalid Masih

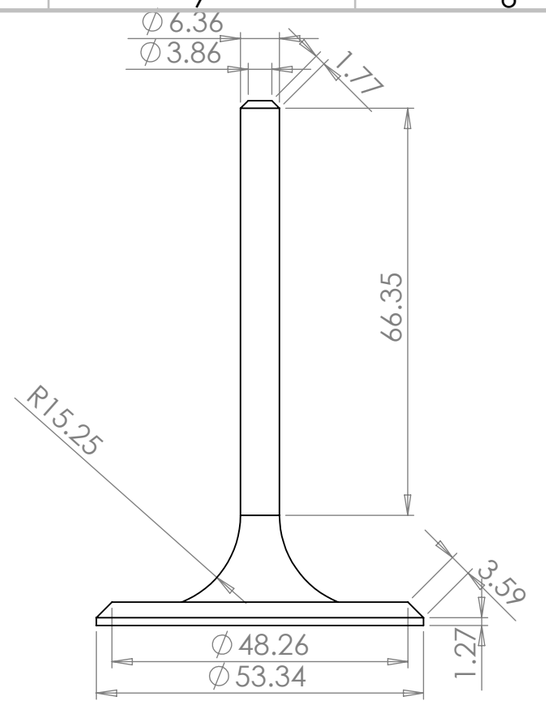


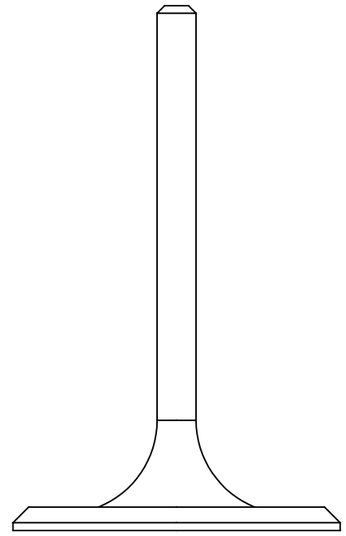


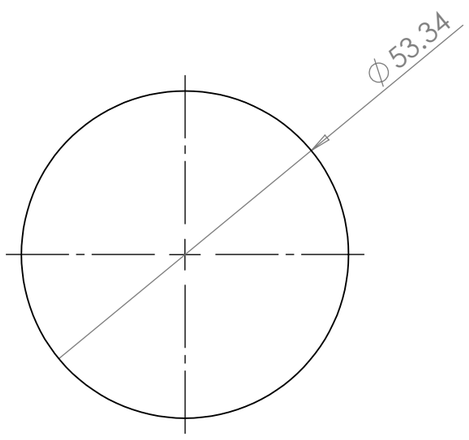


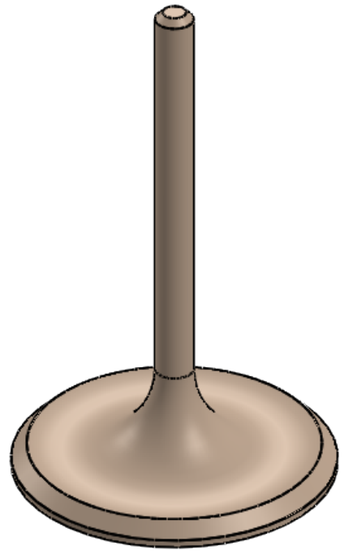


Name	Arsel Kaleem Abbasi	Enging Valve Cover	
Roll no	241190		
Scale	1:5	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih







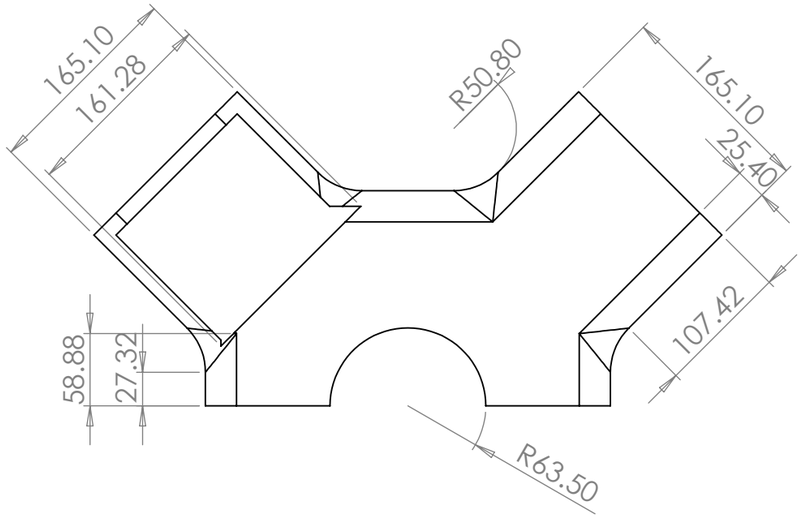


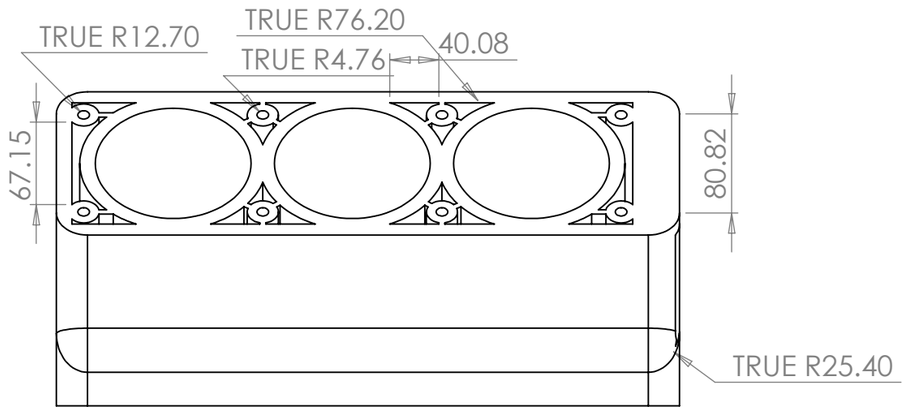
Name	Arsel Kaleem Abbasi
Roll no	241238
Scale	1:1
Section	BEME-F-24-B

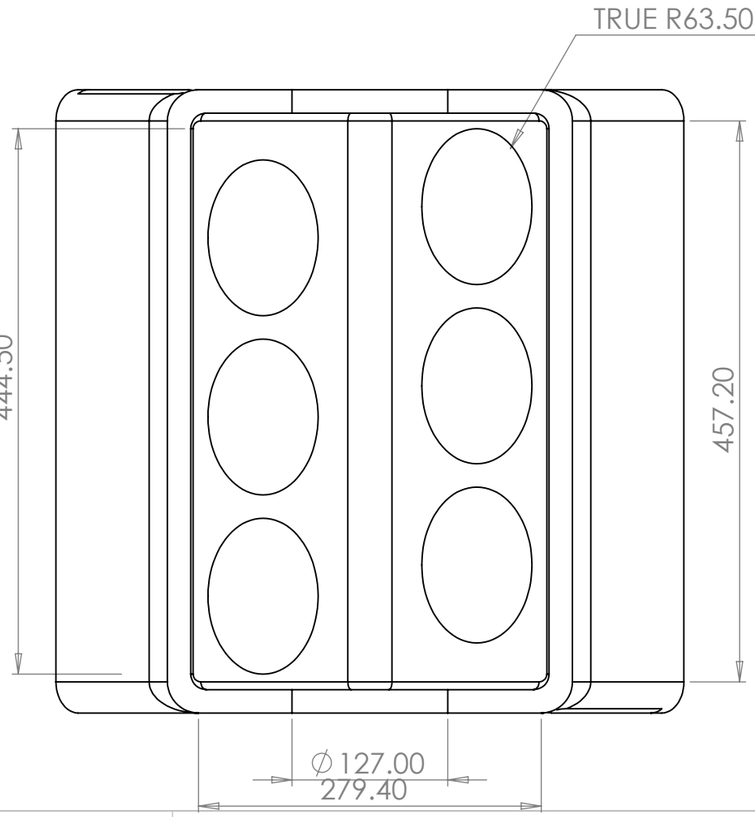
Engine Valve

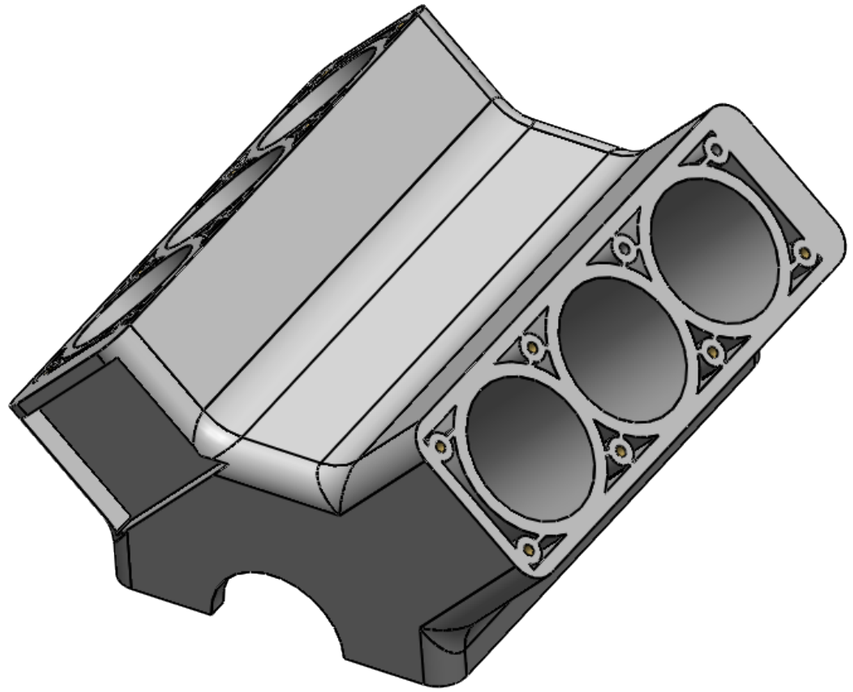
Semester Project Solidworks

Submitted to Sir Mehtab Khalid Masih







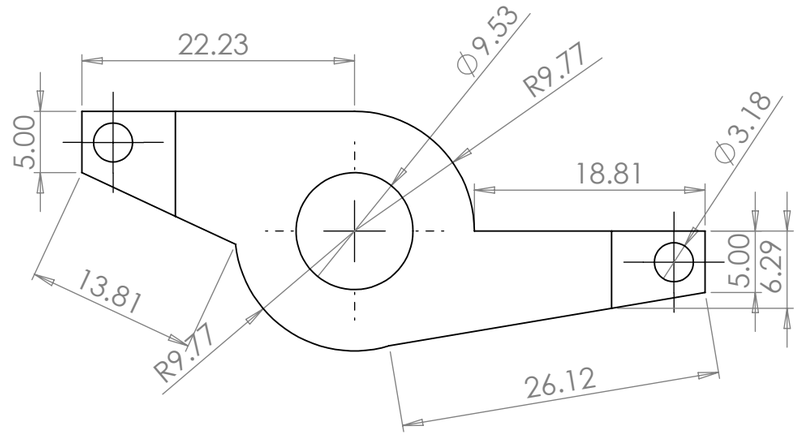


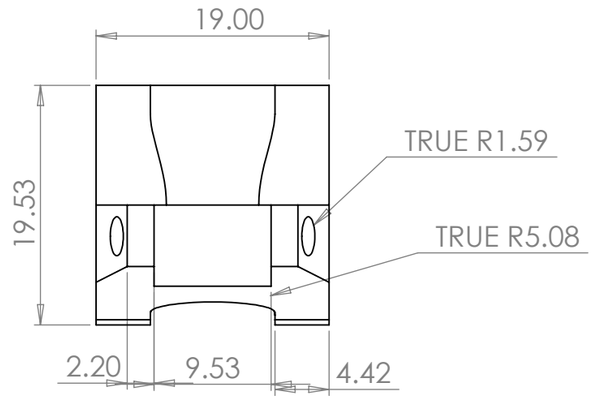
Name	Arsel Kaleem Abbasi
Roll No	241190
Scale	1:5
Section	BEME-F-24B

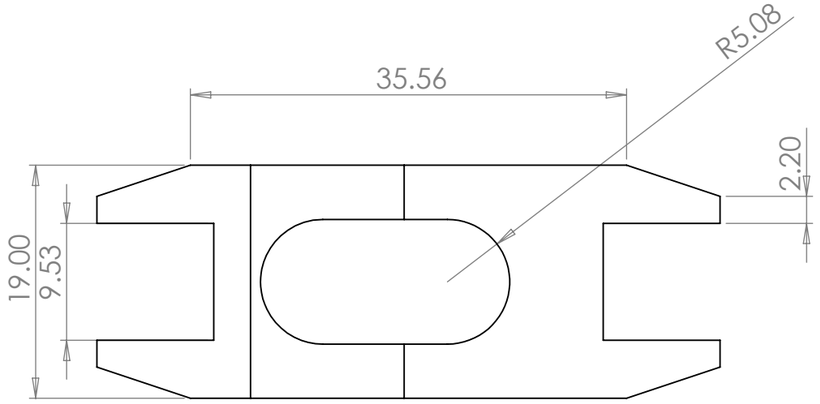
Engine Block

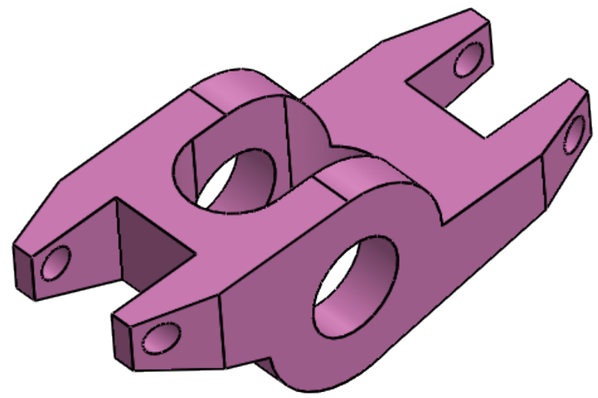
Semester Project Solidworks

Submitted To: Sir Mehtab Khalid Masih

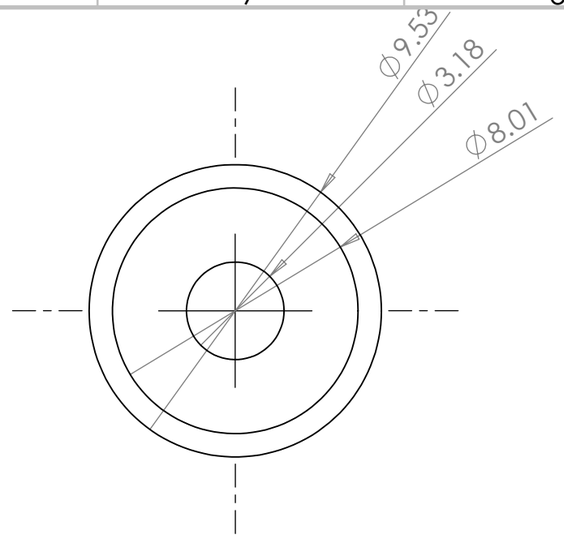


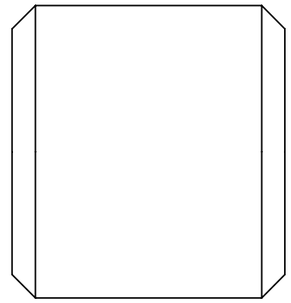


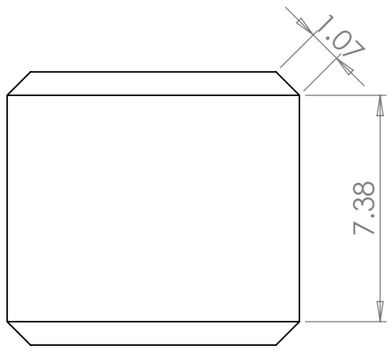


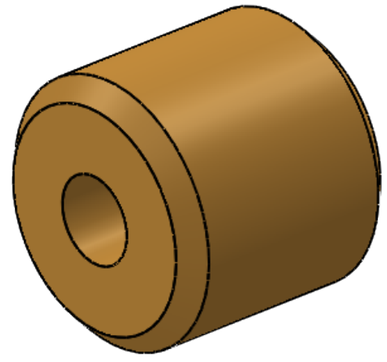


Name	Arsel Kaleem Abbasi	Rocker Arm (a) rocker arm	
Roll no	241190		
Scale	2:1	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih







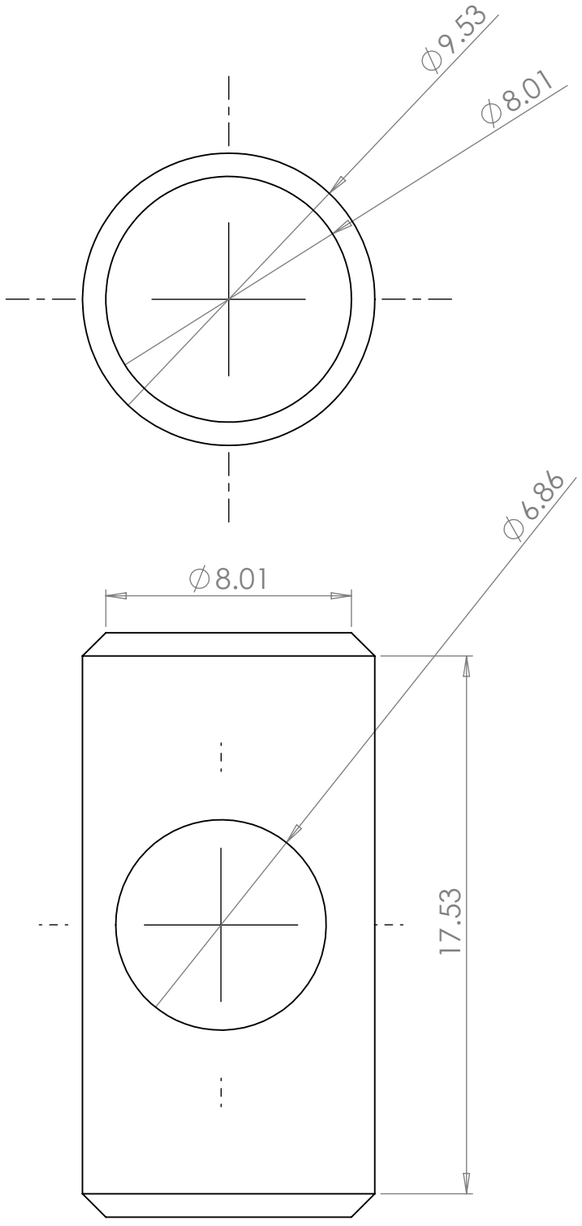


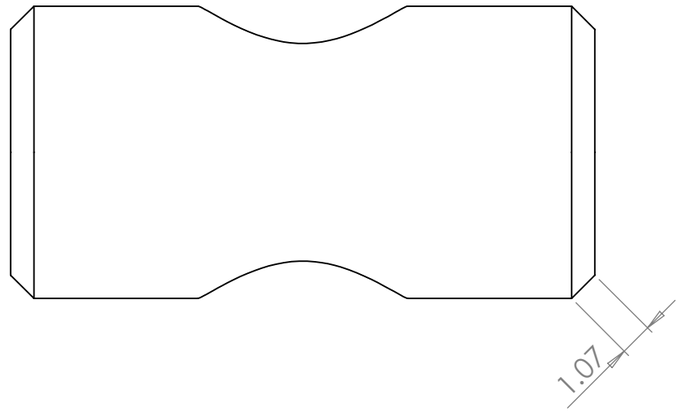
Name	Arsel kaleem Abbasi
Roll no	241190
Scale	5:1
Section	BEME-F-24-B

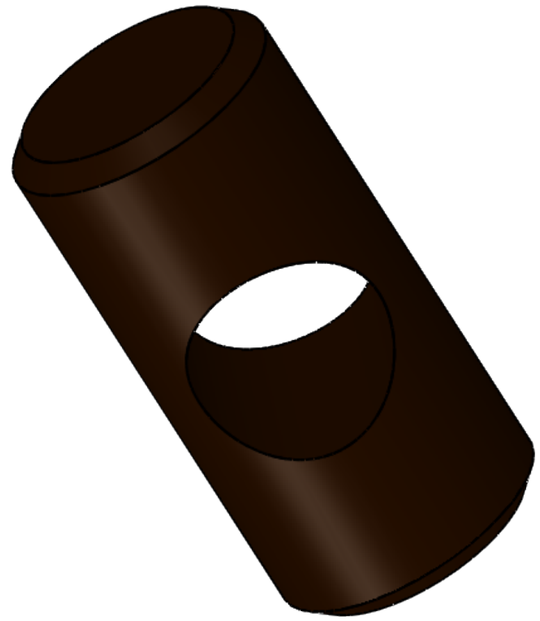
Rocker Arm (b) roller pin

Semester Project Solidworks

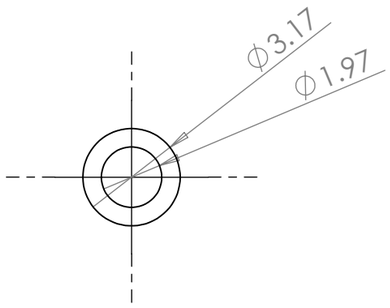
Submitted to	Sir Mehtab Khalid Masih

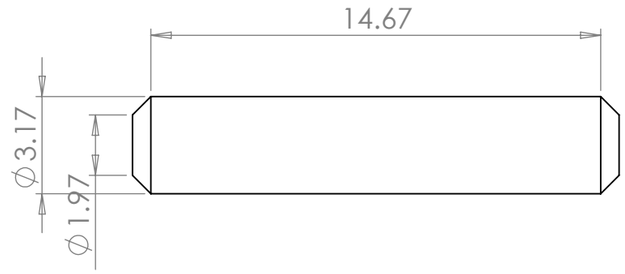


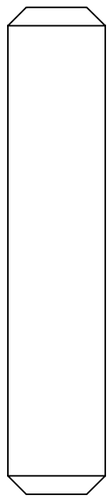


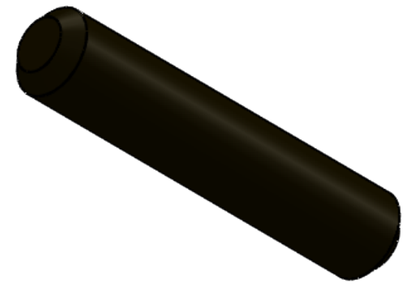


Name	Arsel Kaleem Abbasi	Rocker Arm (c) pin 1	
Roll No	241190		
Scale	5:1	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih

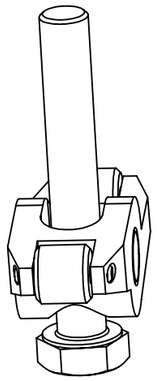


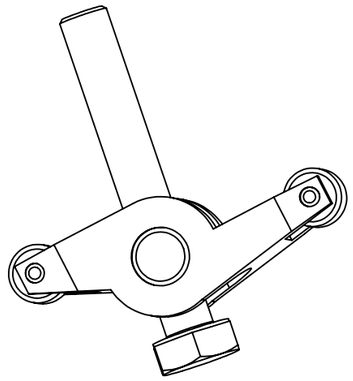


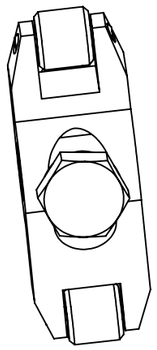


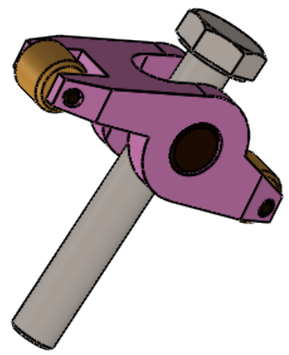


Name	Arsel Kaleem Abbasi	Rocker Arm (d) pin 2	
Roll no	241190		
Scale	5:1	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih

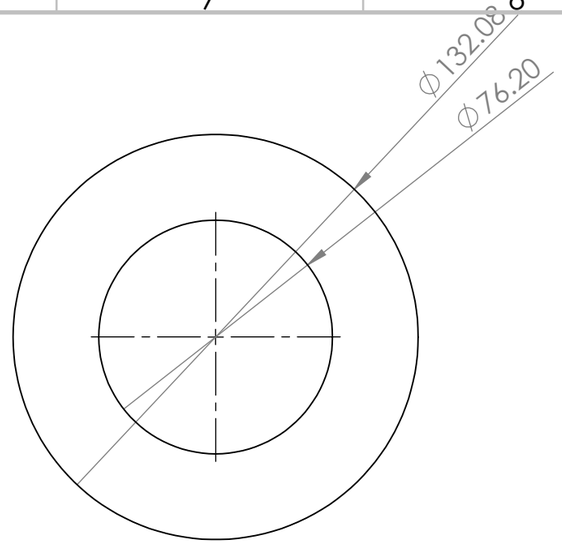


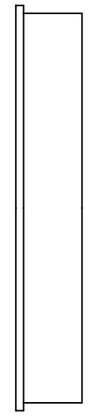


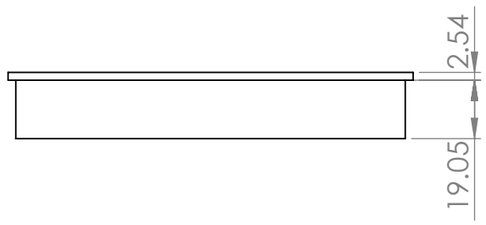


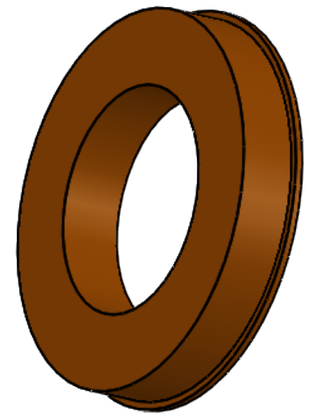


Name	Arsel kaleem Abbasi	Rocker Arm ASSEMBLY	
Roll no	241190		
Scale	1:1	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih

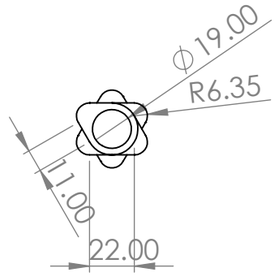


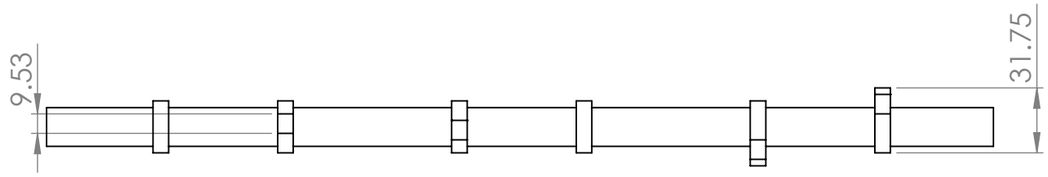


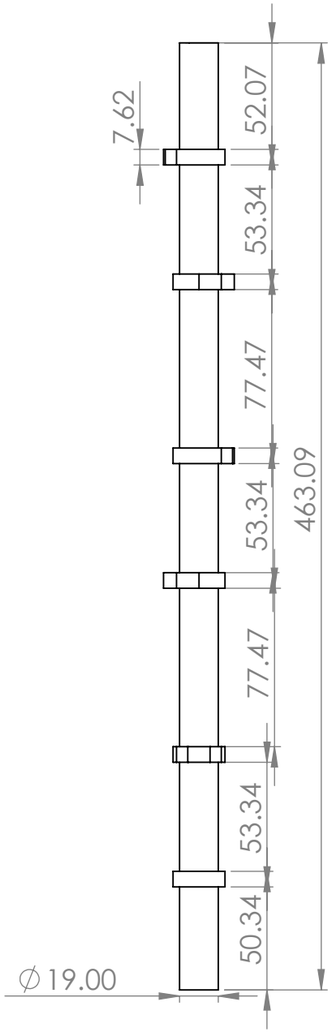


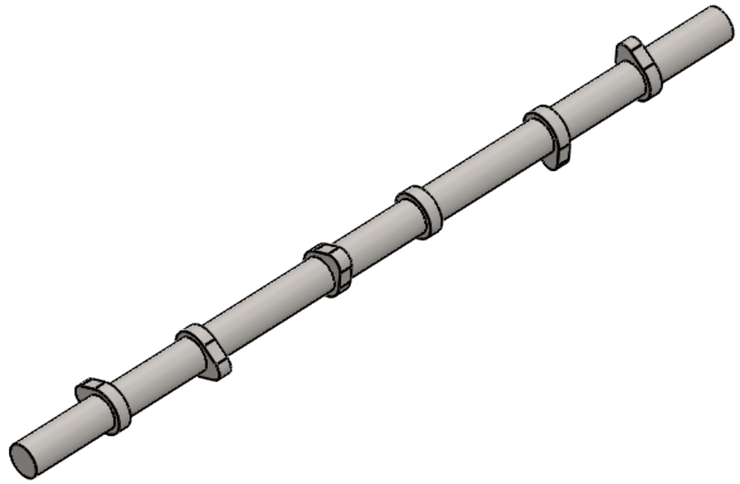


Name	Muhammad Tayyab	CrankShaft Bushing (b)	
Roll no	241235		
Scale	1:2	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih







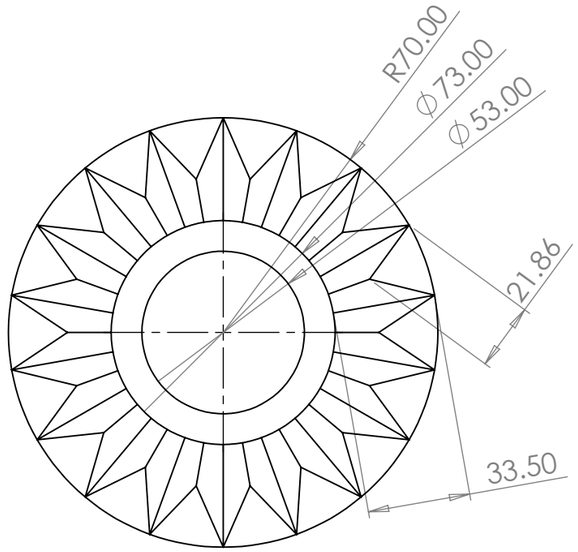


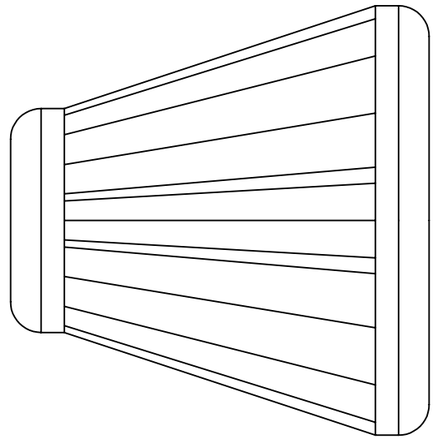
Name	Muhammad Tayyab
Roll no	241235
Scale	1:3
Section	BEME-F-24-B

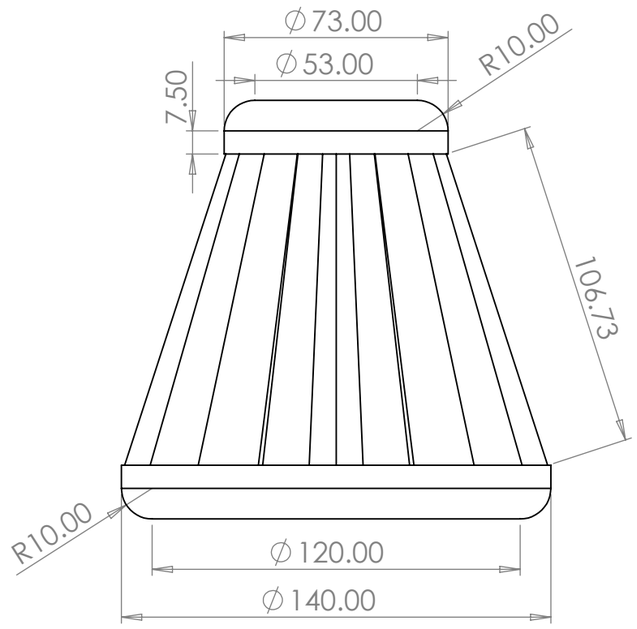
CamShaft

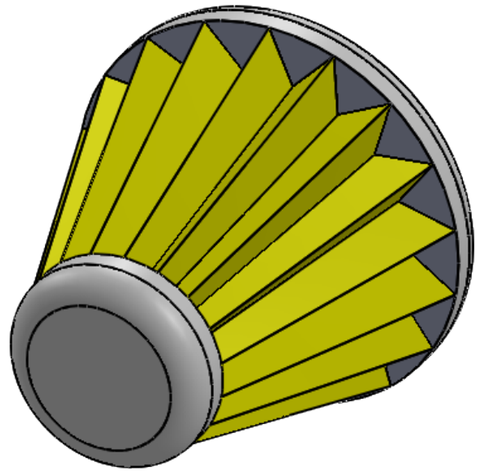
Semester Project Solid works

Submitted to Sir Mehtab Khalid masih

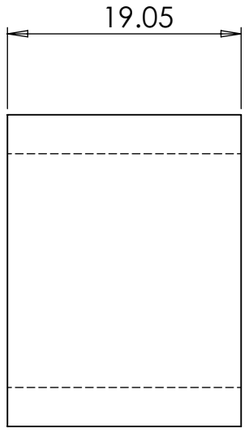


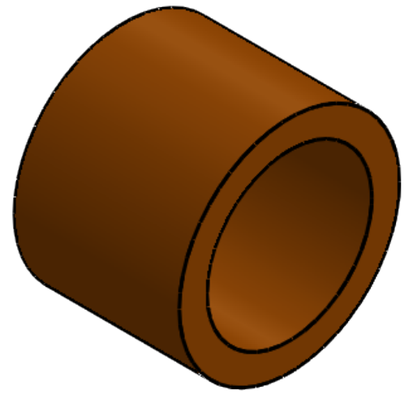


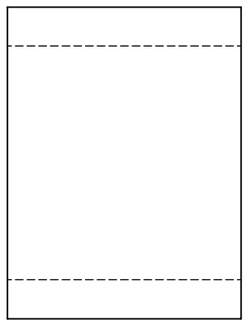


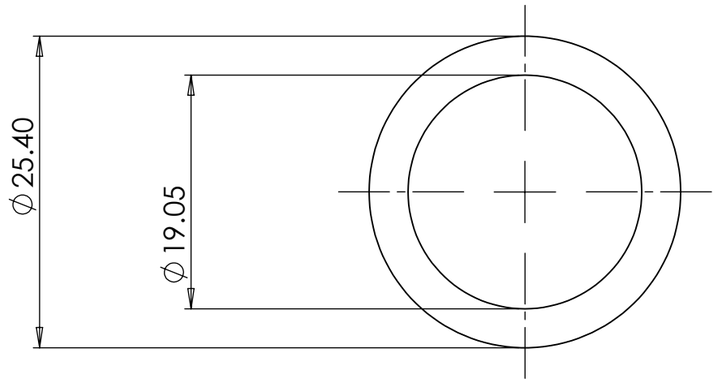


Name	Muhammad Tayyab	Air Filter	
Roll No	241235		
Scale	1:2	Semester Project Solidworks	
Section	BEME-F-24-B	Submitted to	Sir Mehtab Khalid Masih

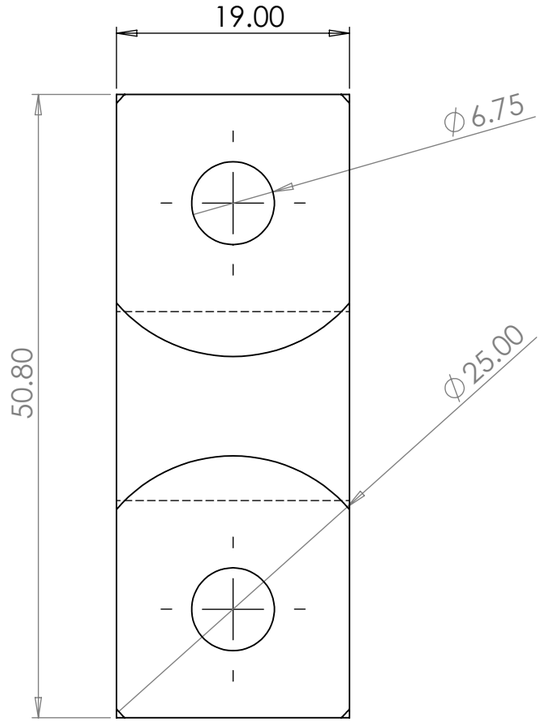


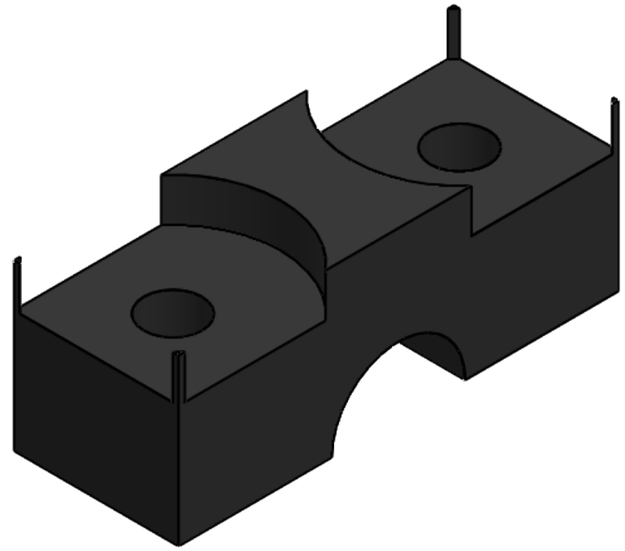


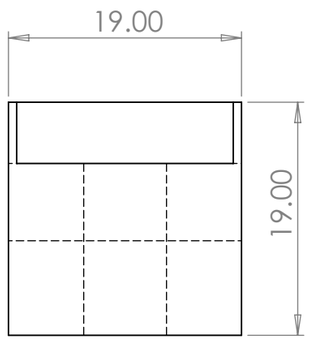


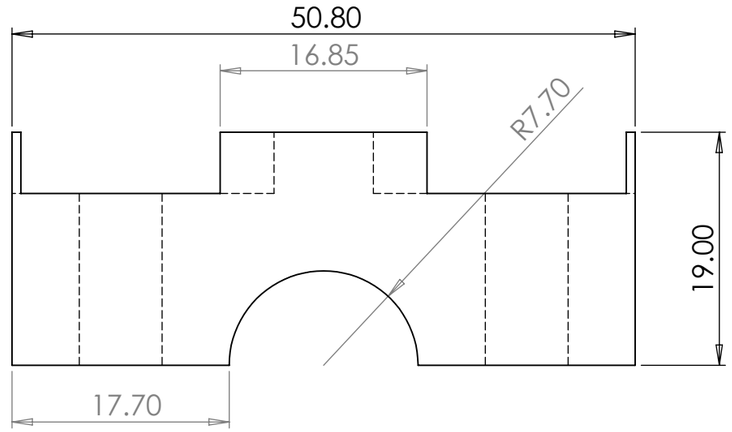


Name	**Muhammad Tayyab**	**CamShaft Bushing**
Roll no	**241235**	
Scale	**2:1**	**semester project solidworks**
Class	**BEME-F-24-B**	**Submitted to :Sir Mehtab**





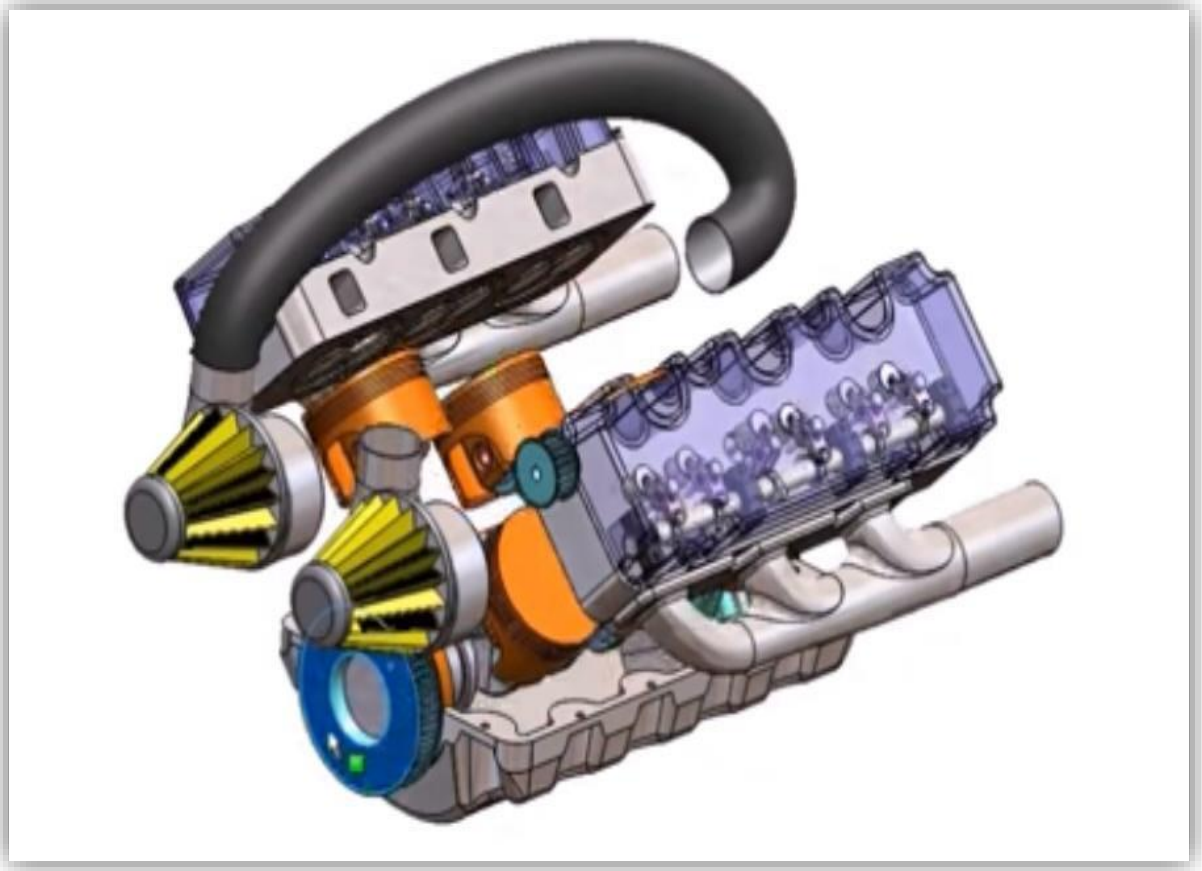




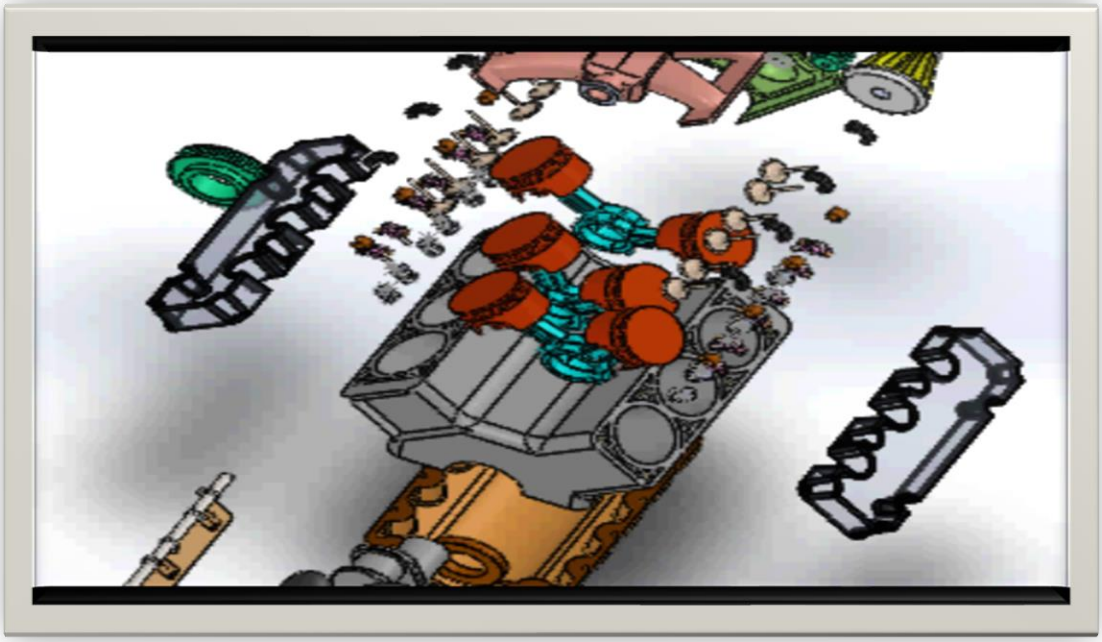
Name	**Muhammad Tayyab**	**CamShaft Retainer**
Roll no	**241235**	
Scale	**2:1**	**semester project solidworks**
Class	**BEME-F-24-B**	**Submitted to : Sir Mehtab**

Assembly:

V6 Engine



Exploded Views:



Challenges:

We Faces very difficult challenges during this project that are:

Complex Assembly Alignment:

Aligning moving parts like the crankshaft, pistons, and camshafts was challenging due to the precise mate requirements. Minor misalignments caused motion errors and disrupted the assembly.

Bevel Gear Synchronization:

Accurately modeling and syncing the bevel gears for the timing system required deep understanding of gear mechanics. Ensuring correct rotational motion between shafts took multiple adjustments.

High Part Count Management:

The large number of components made the SolidWorks assembly heavy and difficult to manage. This led to slow software performance and frequent lag during motion simulation.

Maintaining Realistic Motion:

Ensuring that all engine parts moved realistically and in sync during simulation was difficult. It required careful mate selection and repeated testing to achieve smooth operation.

Conclusion:

The successful design and assembly of the V6 engine in SolidWorks provided valuable insight into the internal structure and operation of an internal combustion engine. Through this project, we enhanced our understanding of mechanical components, gear systems, and the importance of precision in 3D modeling. Despite challenges related to part alignment, gear synchronization, system performance, and hardware limitations, the engine model was completed with full functionality and realistic motion. Overall, this project not only improved our CAD skills but also deepened our practical knowledge of engine mechanics and design principles.

Future Recommendations:

Simulation Enhancements:

Future work could include motion and thermal simulations to analyze the engine's performance under realistic conditions.

Material Application:

Assigning real-world materials to components can help evaluate strength, weight, and durability more accurately.

Detailed Animation:

Creating a full-motion animation of the engine cycle would improve the visual understanding of how components interact.;

Integration with Other Systems

The model can be further expanded by integrating it with transmission or cooling systems to study complete engine behavior.

Hardware Upgrade:

Using a higher-performance device would reduce lag and allow for smoother assembly and simulation of complex models.