C.V. RAMAN POLYTECHNIC, BHUBANESWAR

DEPARTMENT OF MECHANICAL ENGINEERING

AUTOMOBILE ENGINEERING LAB

Pr.1 AUTOMOBILE ENGINEERING LAB

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Practical periods:	4 P/W	Sessional	50
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES

At the end of the course the students will be able to

List of Practical.

1. Study of Automobile chassis.
2. Study the differential mechanism of the Tractor.
3. Study the hydraulic braking system of automobile.
4. Study the cut section model of carburetor solex type and Maruti car type.
5. Study the fuel pump cut section model.
6. Study the actual cut section of gear box.
7. Study of actual car engine.

Automobile Engineering Laboratory (6th semester) Code-Pr-1

Pr.1 AUTOMOBILE ENGINEERING LAB		Levels
CO1	learn about chasis and various assemblies of automobiles.	3
CO2	gain knowledge on differential mechanism.	3
CO3	know about hydraulic braking system.	3
CO4	study cut section model of carburator and fuel pump.	3
CO5	hands on experience of actual cut-section of gear box and car engine.	3

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Average CO
CO1	3.00	-	-	1.00	1.00	-	-	1.67
CO2	3.00	-	-	1.00	-	-	-	2.00
CO3	3.00	1.00	-	-	-	-	-	2.00
CO4	3.00	-	-	1.00	-	-	-	2.00
CO5	3.00	1.00	1.00	1.00	1.00	-	-	1.40
Average PO	3.00	1.00	1.00	1.00	1.00	-	-	**1.81** / **1.40**

Sessional Rubrics (50)

	Attendance (5)	Record (10)	Experiment/Job (25)	Viva (10)
	The student attends all the classes.	Report is well written. The Contents are equipped with neat sketch, error free calculations and free from grammatical errors.	Identifying equipment, instruments and material and setting up of machine tool. Exhibits proper knowledge of the lab procedure. Runs the machine independently. Takes all the readings from machine/apparatus during experiment. The obtained result is calculated correctly to find the result. Analyses if any error occurred with the reason. The experiment is completed within the time limit with taking proper safety precautions. Discipline and ethics is maintained while performing the experiment.	A set of questions is asked relating to the experiment and subject.

Rating/Performance criteria	25	22	20	15	10	8	5	4	3	2	1
Attendance (5)							Answers to 100% of questions asked	Answers to 90% of questions asked	Answers to 70% of questions asked	Answers to 50% of questions asked	
Record (10)					Performs 100% of the criteria	Performs 90% of the criteria	Performs 80% of the criteria	Performs 70% of the criteria	Performs 60% of the criteria	Performs 50% of the criteria	Performs 30% of the criteria
Experiment/Job (25)	Performs 100% of the criteria	Performs 90% of the criteria	Performs 80% of the criteria	Performs 70% of the criteria	Performs 60% of the criteria	Performs 50% of the criteria	Performs 40% of the criteria	Performs 30% of the criteria	Performs 20% of the criteria		
Viva (10)					Performs 100% of the criteria	Performs 90% of the criteria	Performs 80% of the criteria	Performs 70% of the criteria	Performs 60% of the criteria	Performs 50% of the criteria	Performs 30% of the criteria

Sessional (50)

Sl. No.	Name of student	Registration number	Attendance (5)	Record (10)	Experiment (25)	Viva (10)	Total (50)

Practical Rubrics (50)

	Report (15)				Experiment/Job (25)				Viva (10)		
	Report is well written. The Contents are equipped with neat sketch, error free calculations and free from grammatical errors.				Identifying equipment, instruments and material and setting up of machine tool. Exhibits proper knowledge of the lab procedure. Runs the machine independently. Takes all the readings from machine/apparatus during experiment. The obtained result is calculated correctly to find the result. Analyses if any error occurred with the reason. The experiment is completed within the time limit with taking proper safety precautions. Discipline and ethics is maintained while performing the experiment.				A set of questions is asked relating to the experiment and subject.		
Rating/Performance criteria	25	24	21	18	15	12	10	8	6	4	2
Report (15)					Answers to 100% of questions asked	Answers to 75% of questions asked	Answers to 60% of questions asked	Answers to 50% of questions asked	Answers to 40% of questions asked	Answers to 30% of questions asked	
Experiment/Job (25)	Performs 100% of the criteria	Performs 90% of the criteria	Performs 80% of the criteria	Performs 70% of the criteria	Performs 60% of the criteria	Performs 50% of the criteria	Performs 40% of the criteria	Performs 30% of the criteria			
Viva (10)							Answers to 100% of questions asked	Answers to 90% of questions asked	Answers to 70% of questions asked	Answers to 50% of questions asked	Answers to 30% of questions asked

Practical (50)

Sl. No.	Name of student	Registration number	Report (15)	Experiment (25)	Viva (10)	Total (50)

Programme outcomes (POs) and Programme specific outcomes (PSOs) to be achieved through the practical of this course:-

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.
3. **Design/development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing:** Apply mode m engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyses individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSO-1	Discipline knowledge	Demonstration and understanding of tools with advanced software for design specification and operation of Mechanical Engineering systems, components and processes.
PSO-2	Professional Skills	Apply contextual knowledge to analyze social, environmental, health, safety, legal, and cultural issues with professional ethics as part of the lifelong learning process. To be equipped to lead a team or operate successfully alone as an individual managing tasks in trans-disciplinary areas.

INDEX
List of practical and progressive assessment sheet

Sl. No.	Title of experiment	Date of experiment	Date of Submission	Remarks
1	Study of Automobile chassis.			
2	Study the differential mechanism of the Tractor.			
3	Study the hydraulic braking system of automobile.			
4	Study the cut section model of carburetor solex type and maruti car type.			
5	Study the fuel pump cut section model.			
6	Study the actual cut section of gear box.			
7	Study of actual car engine.			

EXPERIMENT NO: 1

Aim of the experiment:

To study automobile chassis.

Apparatus required:

Model of automobile chassis.

Theory:

Chassis is the main support structure of the vehicle which is also known as ‘Frame’. It bears all the stresses on the vehicle in both static and dynamic conditions. In a vehicle, it is analogous to the skeleton in living organisms. Every vehicle whether it is a two-wheeler or a car or a truck has a chassis-frame.
However, its form obviously varies with the vehicle type.

The chassis of an automobile consists of following components suitable mounted.
Engine
Transmission system consisting of clutch, gear box, propeller shaft, and the rear axle.
Suspension system.
Road wheels Steering system.
Brakes.
Fuel tanks.
All the components listed above are mounted in either of the two ways i.e. the conventional construction and frameless or unitary construction.

Conventional construction:

In this type of construction, the frame is the basic unit to which various components are attached and body is bolted onto the frame later on.

Frameless construction:

In this type of construction heavy side members used in conventional construction are eliminated and the floor is strength by cross- members and the body, all welded together.

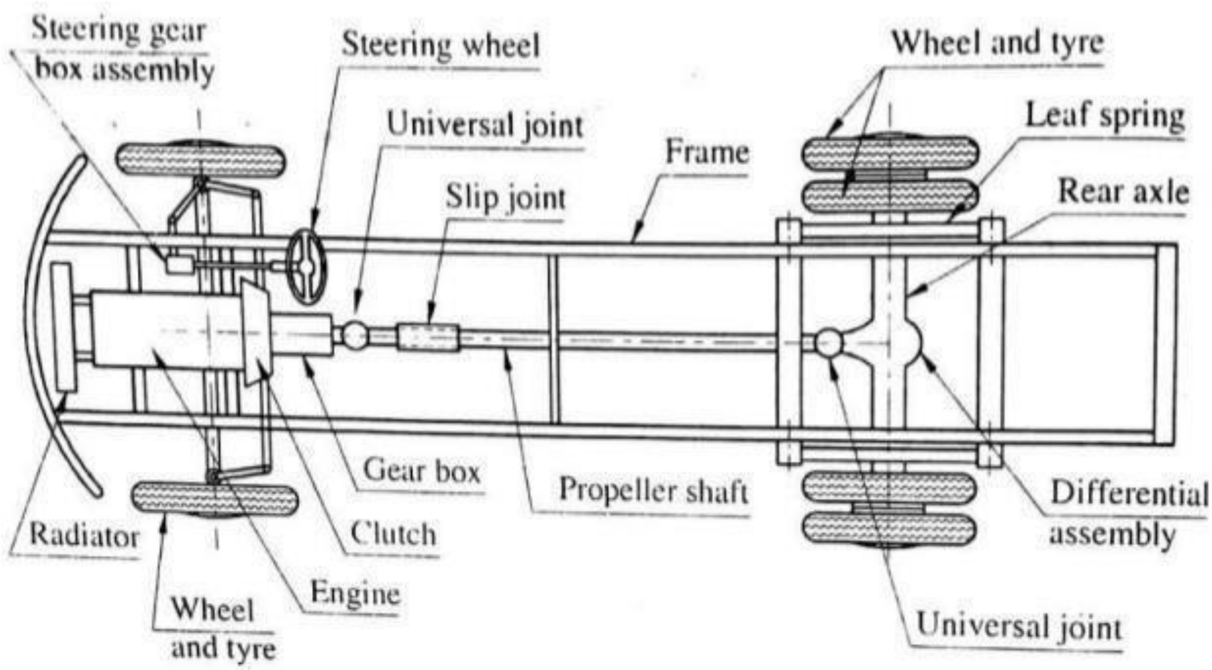
Functions of the frame:

1. To support the chassis components and the body.
2. To withstand static and dynamic loads without undue deflection.

Loads on the frame:

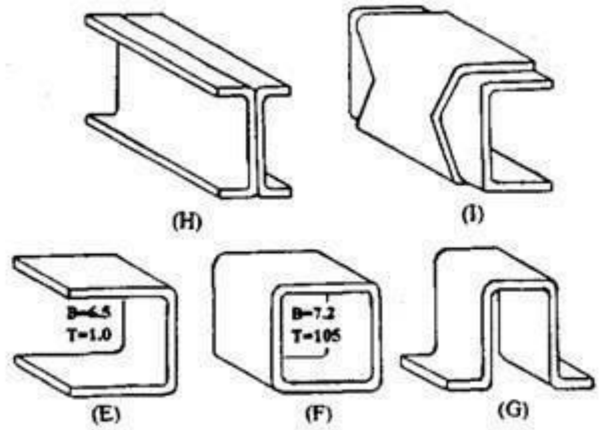
1. Weight of the vehicle and the passengers.
2. Vertical loads when the vehicle comes across a bump.
3. Engine torque.
4. Inertia loads due to brake application.
5. Impact loads during collision.
6. Cornering force while taking a turn.

Frame construction:



A simplified diagram representing the frame shows the longitudinal members, cross members, engine, clutch, gear box, propeller shaft, differential, rear axle, etc. The engine is usually mounted on the front of the frame. It is supported on the frame at three places by means of rubber blocks. This helps to isolate the engine from road shocks and the body from the engine vibrations.

Various cross sections used for the side members are shown in figure bellow.



Since the commercial vehicles have to carry large loads, framed construction is invariably used for these.

<u>Materials for frame</u>:
Steels used for frames are mild steel sheet, Nickel alloy steel sheet.

<u>Conclusion</u>:
The chassis of the automobile was studied successfully.

EXPERIMENT NO: 2

Aim of the experiment:

To study the differential mechanism of the Tractor.

Apparatus required:

Model of differential mechanism.

Theory:

Components of differential:

1. Pinion gear.
2. Ring gear/Crown wheel.
3. Spider gear/planet gear (It moves in 2 ways i.e. about its own axis and along with ring gear).
4. Side gear/sun gear.

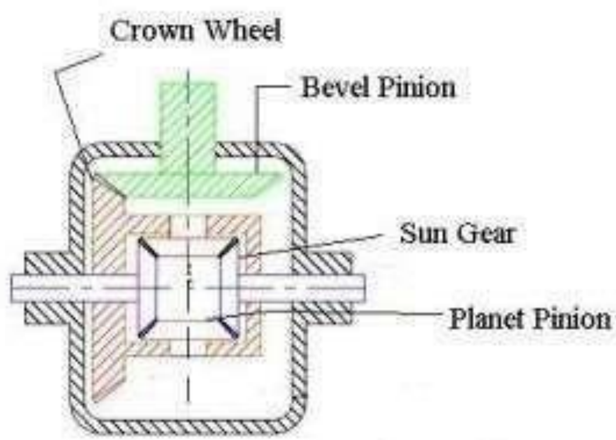
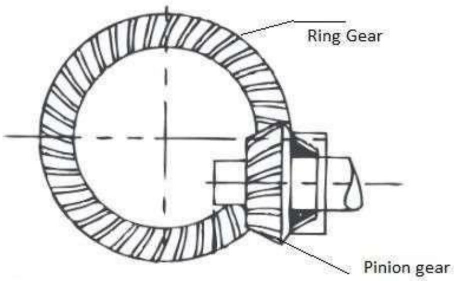


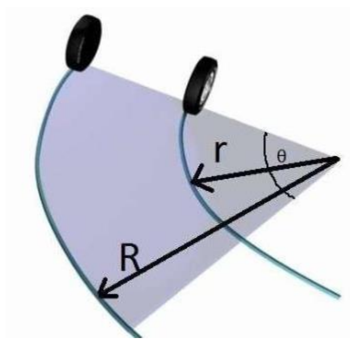
Fig: Differntial gear Assembly



Ring gear and pinion gear

Function:

The function of differential is to make drive wheels of a vehicle rotate at different speeds whenever necessary. Different speeds of drive wheels are required while turning the vehicle.



In the above figure the distance moved by inner wheel= r**θ** and the distance moved by outer wheel = R**θ**

It's evident from the figure that the R>r. So the outer wheel travels more distance than the inner one. Again both the wheels have to travel corresponding distances in same time. So to turn the vehicle without skidding in above case the outer wheel has to move faster than the inner wheel. This requirement of drive wheels is accomplished by employing differential mechanism.

Working principle:

First the power is transferred from propeller shaft to pinion gear. Pinion gear transfers power to the ring gear. As the spider gear is connected with the ring gear, the spider gear rotates along with it. Finally, from the spider gear, power gets transferred to both the side gears.

When the vehicle moves straight, the spider gear doesn't spin & will make BOTH the side gears rotate at same speed.

When the vehicle moves on a curved road, the spider gear itself spins & either of the side gears move slower or faster than other one. Which will be faster & which will be slower is decided by the turn.

Conclusion:
The differential mechanism of automobile was studied successfully.

EXPERIMENT NO: 3

Aim of the experiment:

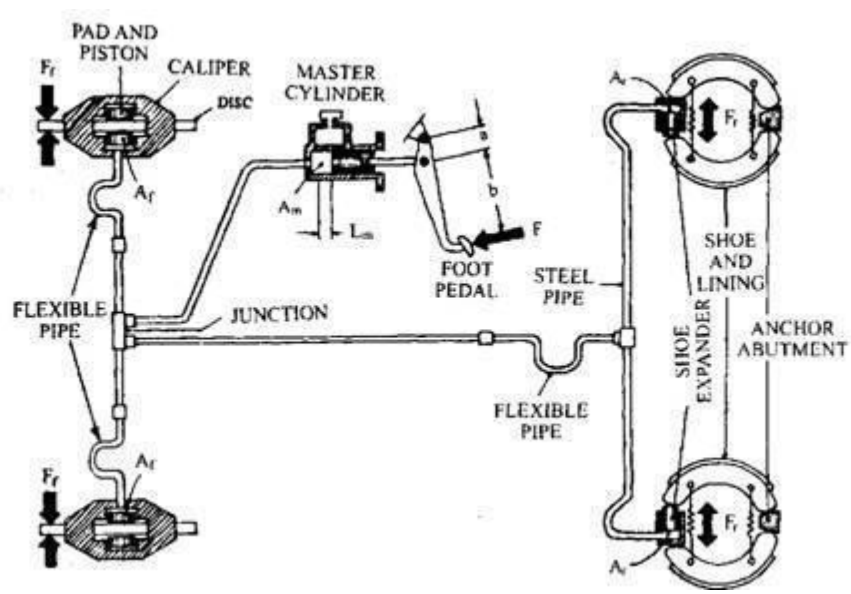
To study hydraulic braking system.

Apparatus required:

Hydraulic braking system model.

Theory:

A hydraulic braking system transmits brake-pedal force to the wheel brakes through pressurized fluid, converting the fluid pressure into useful work of braking at the wheels. A simple, single-line hydraulic layout used to operate a drum and disc brake system is illustrated in Fig. The brake pedal relays the driver's foot effort to the master-cylinder piston, which compresses the brake fluid. This fluid pressure is equally transmitted throughout the fluid to the front disc-caliper pistons and to the rear wheel-cylinder pistons.



In a hydraulic braking system, the braking force is directly proportional to the ratio of the master-cylinder cross-sectional area to the disc or drum-brake wheel- cylinder cross-sectional areas. Therefore, these cylinder diameters are appropriately chosen to produce the desired braking effect. The wheel-cylinder cross-sectional areas of the front and rear disc-and drum-brakes respectively may be chosen to produce the best front-to-rear braking ratio. Hydraulic fluid is incompressible provided there is no trapped air in the system. If air is present in

the braking circuit, the foot-brake movement becomes spongy. In a hydraulic system the internal
friction exists only between the cylinder pistons and seals. The friction is caused by the fluid pressure squeezing the seal lips against the cylinder walls as the piston moves along its stroke.

The hydraulic system offers the following advantages over the mechanical layout,

(a) This provides equal braking effort on all wheels.

(b) This requires relatively less braking effort to deliver the same output.

(c) This is a fully compensated system so that each brake receives its full share of the pedal effort.

(d) The efficiency of the hydraulic system is greater than that of the mechanical layout.

(e) This system is suitable for vehicles having independent suspension.

(i) It is easy to alter thrust on shoe because the force exerted on a piston depends on the piston area. The larger the area, the greater the thrust on the trailing shoe, so a larger piston can be used.

Components of hydraulic brake:

Brake pipes:

These are steel pipes which form part of the fluid circuit between the master- cylinder and the wheel-cylinders. These pipes transfer the fluid along the body structure and rigid axle members. Flexible hoses connect the sprung body pipes to the unsprung axle wheel-brake units, to allow for movement

Master cylinder:

This converts foot-pedal force to hydraulic pressure within the fluid system by means of the cylinder and piston.

Disc brake:

This comprises of a disc bolted to the wheel hub. This is sandwiched between two pistons and friction pads. The friction pads are supported in a caliper fixed to the stub-axle. When the brakes are applied, the pistons clamp the friction pads against the two side faces to the disc.

Drum brake:

This uses two brake-shoes and linings supported on a back-plate. The back-plate is bolted to the axle-casing. These shoes pivot at one end on anchor pins or abutments attached to the back-plate. The other free ends of the both shoes are forced apart when the brakes are applied. The shoes expand radially against a brake-drum positioned concentrically on the wheel hub.

Wheel cylinder:

As the hydraulic line pressure acts on the cross-sectional area of the disc and drum cylinder pistons in wheel cylinders, the hydraulic pressure is converted into braking effort. This braking effort either presses the friction pads against the side faces of the disc or forces the shoe friction linings against the inside of the drum.

Conclusion:

The hydraulic braking system was studied successfully.

EXPERIMENT NO: 4

Aim of the experiment:

Study the cut section model of carburetor solex type and Maruti car type.

Apparatus required:

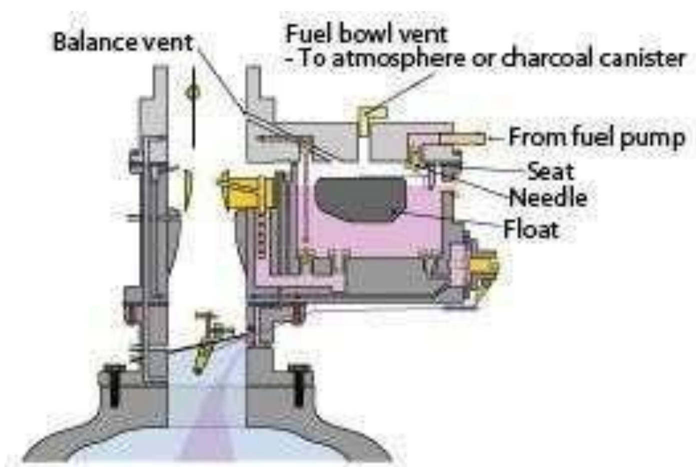
Model of carburetor.

Theory:

Carburetor is a device that produces air fuel mixture for internal combustion engine. There are six different circuits of carburetor. The circuits are:

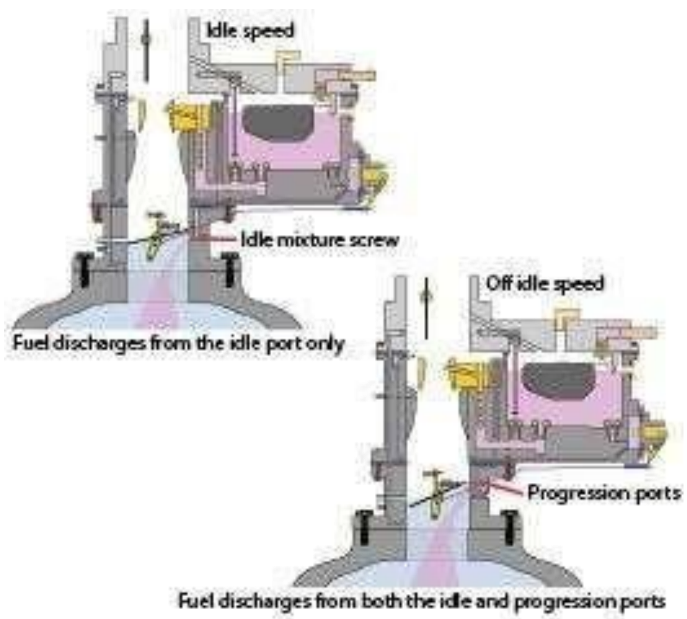
1. Float circuit
2. Idle circuit
3. Main metering circuit.
4. Power circuit
5. Accelerator pump circuit.
6. Choke circuit.

Float Circuit:



The float chamber holds a quantity of ready-to-use fuel at atmospheric pressure. Its supply is refilled by a float driven valve. As the level drops, the float drops too and opens an inlet, which allows the fuel pump to deliver more fuel to the float chamber. The float rises with the replenished fuel level, closing off the inlet. To allow atmospheric pressure to act on the fuel, the float bowl is open to either the atmosphere (unbalanced carburetor), the air horn above the venturi (balanced carburetor), or the charcoal canister (evaporative emission carburetor). If the float level is too low, more airflow through the venturi will be required to pull out the fuel, leaning out the air–fuel ratio. Consequently, too high of a float level will cause the mixture to be too rich. Float adjustment is important when rebuilding a carburetor. Flooding a carburetor also produces rich mixtures. Flooding can be caused by a worn needle and seat, or by dirt trapped between the needle and seat that causes the level in the float bowl to rise and fuel to dribble from the nozzle, resulting in little or no venturi action.

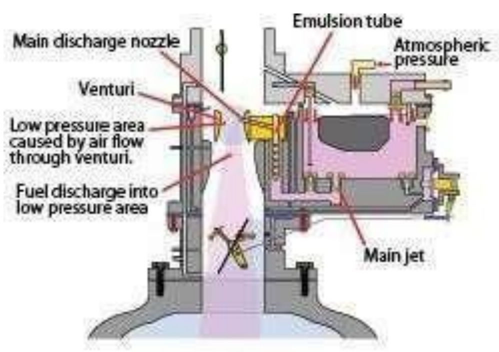
Idle Circuits:



When the throttle valve is closed or nearly closed, the manifold vacuum created behind the throttle is sufficient to pull a small amount of fuel and air through small openings located after the butterfly valve. This design is called the idle circuit, and it enables the engine to keep running when there is not enough air speed through the venturi to create a vacuum. As the throttle valve opens slightly, the manifold vacuum is reduced, so additional small openings are revealed to compensate for this. This design is the “off-idle” circuit.

Main Metering Circuit:

The main metering circuit comes into action above fast idle, as airflow through the venturi increases. A main metering jet in the float bowl meters fuel passing into the discharge nozzle. How much fuel leaves the nozzle depends on the pressure difference created by the airflow through the venturi. As the throttle opens, and airflow increases and speeds up, more and more fuel is drawn from the discharge nozzle. However, the mass of air does not increase in proportion with the speed, and as a result, high speeds can produce a mixture that is too rich. To correct this, more air can be added. This is called compensation by air correction.

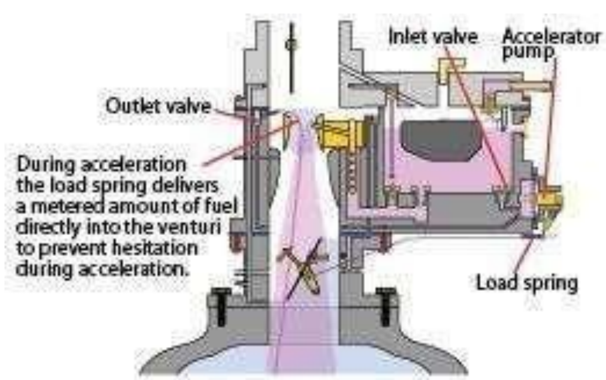


As the throttle opens and engine speed increases, the level in the jet well falls, exposing air bleed holes in the discharge tube. Air can now mix with the fuel and prevent the mixture from becoming too rich. As the throttle opens farther, the fuel level falls too, exposing more air holes. More air bleeds in to maintain the correct mixture. Main metering fuel flow can typically be adjusted by replacing the removable jets with jets having larger or smaller orifices.

Power Circuit:

The size of the main jet is selected to provide the best mixture for economy under cruising conditions. When the throttle is open wide for maximum power, a richer mixture is required. The extra fuel is provided by a power valve, with a vacuum piston and rod opening it as it is needed. At low speeds, intake manifold vacuum is transferred through a passage to the vacuum piston. This holds the piston up and keeps the power valve closed. With the throttle valve fully open for full engine power, the vacuum in the intake manifold falls. A spring pushes down the vacuum piston and rod to open the power valve. Additional fuel flows through the power valve to enter the fuel well and add to the fuel from the main jet. This provides the extra fuel needed to enrich the mixture for full power. Some carburetors use metering rods instead of a vacuum piston. The metering rods are pulled down into the main jets at idle and cruise to restrict the fuel flow. When manifold vacuum drops under heavy load, springs push the metering rod(s) up, increasing the opening size of the main jet(s). Other carburetors use a diaphragm type power valve that opens an additional passage when vacuum drops under load.

Accelerator Pump Circuit:



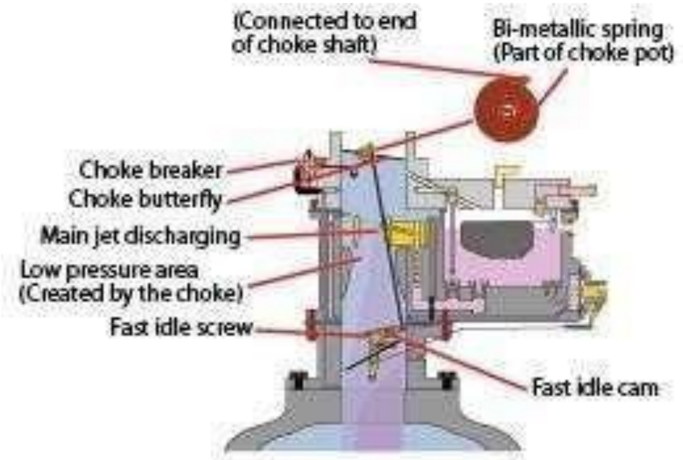
Extra fuel is also needed for accelerating. Suddenly opening the throttle increases the airflow, but fuel cannot flow from the discharge nozzle quickly enough to match it. An extra squirt of fuel is needed, which is where the accelerator pump circuit comes into play. Depressing the pedal compresses a duration spring that exerts a force on the plunger of a small plunger pump. This pressurizes fuel below the plunger and closes off the inlet valve. Fuel flows past a check valve and enters the airstream from a discharge nozzle above the venturi. The duration spring extends the time for delivering the fuel. Releasing the pedal lets the linkage move the plunger upward. The check valve closes and the inlet valve opens to let fuel refill the pump chamber from the float bowl, priming it for the next shot of fuel.

Thus, whenever the throttle is opened, the accelerator pump discharges a small amount of fuel into the throat of the carburetor.

The Choke:

Fuel ignites less readily when cold, and if the engine is also cold, then some fuel vapor can condense out of the air–fuel mixture onto the intake manifold and cylinder walls. This loss of air makes the combustible mixture leaner. To compensate for this, a valve known as the choke restricts the flow of air at the entrance to the air horn, lowering the pressure at the venturi and off-idle circuits even though the throttle valve has been opened. In this way, fuel is sucked into the incoming air through all the fuel circuits—idle, off-idle, and main—at the same time.

The choke can be controlled manually by a cable that operates the valve. However, most are controlled automatically so that the valve is closed when the engine is cold and opens progressively as the engine warms up. When the engine is warm, the fuel drawn into the manifold vaporizes readily, and the engine can be started without the aid of a choke. The choke should operate as briefly as possible. Overusing it produces rich mixtures that cause exhaust pollution and increase fuel consumption. Some later-model carburetors that used a cable- operated choke also used a spring-loaded choke release that turned the choke off after a set time.



Conclusion:

Different circuits of carburetor are successfully studied.

EXPERIMENT NO: 5

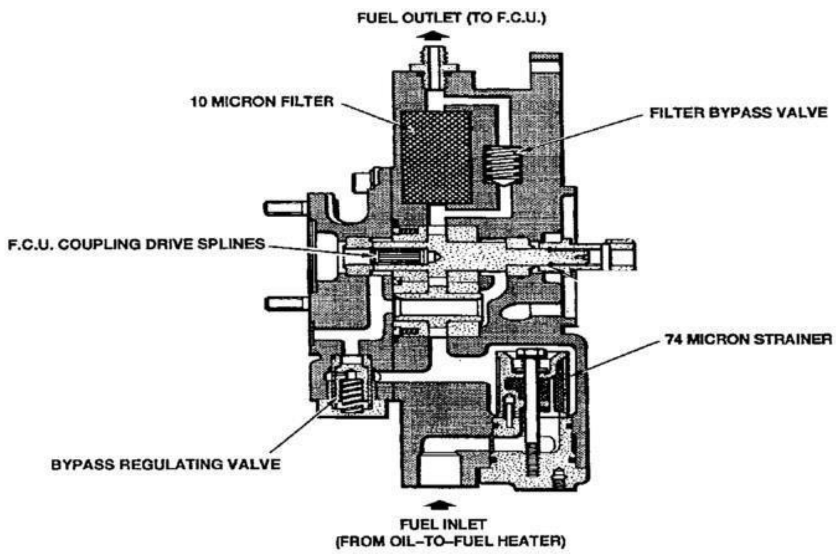
Aim of the experiment:

Study the fuel pump cut section model

Objective:

Students will be able to understand the inner functioning of a fuel pump.

Theory:



A car engine burns a mixture of petrol and air. Petrol is pumped along a pipe from the tank and mixed with air in the carburetor, from which the engine sucks in the mixture. In the fuel-injection system, used on some engines, the petrol and air are mixed in the inlet manifold. A fuel pump draws petrol out of the tank through a pipe to the carburetor. The pump may be mechanical worked by the engine-or it may be electric , in which case it is usually next to or even inside the fuel tank.

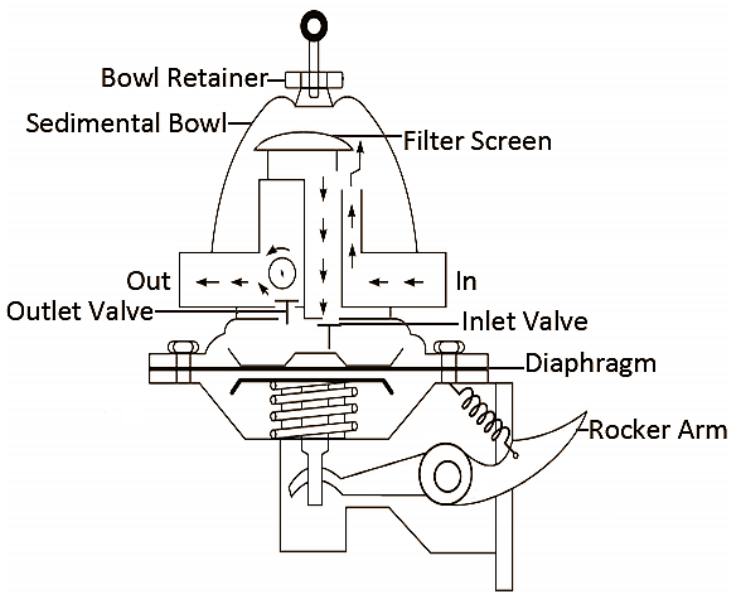
The purpose of the fuel pump is to meter the correct quantity of fuel and deliver it at the correct time to the engine cylinder according to the varying load and speed requirements.

Construction and Working of Mechanical Fuel Pump:

Mechanical fuel pump is function also directly or during a push rod, through an eccentric on Camshaft.

It consists of following major parts:

(1) Rocker arm. return spring and connecting link
(2) Sediment bowl with retainer.
(3) Lower body contains diaphragm. link and spring.
(4) Upper body contain inlet and outlet check valves.



While camshaft turns, rocker arm of fuel pump is motivated back and forth. The unusual on camshaft pushes the rocker arm lacerate towards body of fuel pump. As the eccentric move off. Go back spring pushes rocker arm for ward to wards engine camshaft. As the rocker arm is pressed back through the eccentric diaphragm in pun is pulled down, which make in the major chamber. During this point , Inlet valve opens due to suction cause and fuel rush into the major chamber as of the inlet chamber. When eccentric pressure on rocker arm is out, the diaphragm moves upwards due to tension of the spring placed under it. At this time the outlet valve opens with the fuel is pump out of fuel pump.

Working of Mechanical Fuel Pump As eccentric pushes rocker arm:

1. Diaphragm miss pulled down during the connecting link.
2. Suction or vacuum is formed in the major chamber.
3. Inlet valve opens.
4. Fuel rushes in to the major chamber.
5. Out let valve remains closed.

Due to the up and clown movement of diaphragm suction and pumping cause is repeat again and again. Fuel as of the tank is drawn and pumped to carburetor with this action of pump.

Equipment used : fuel pump cut section model.

Precautions:

1. Hands must not be put inside the cut section or the cut parts in order to avoid sharp edges.

2. Greasing/Oiling should be carried out at regular intervals.

Conclusion:

Fuel pump cut section model is successfully study.

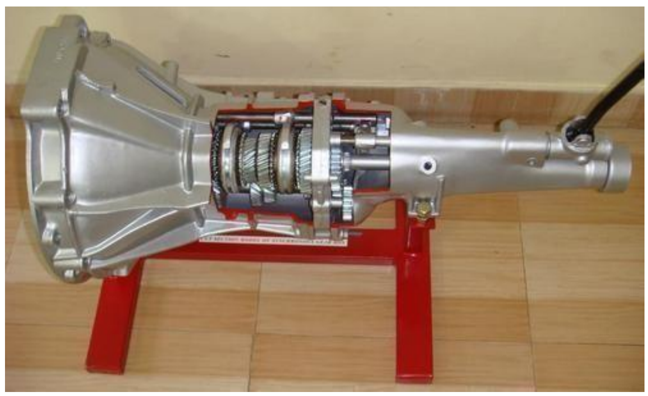
EXPERIMENT NO: 6

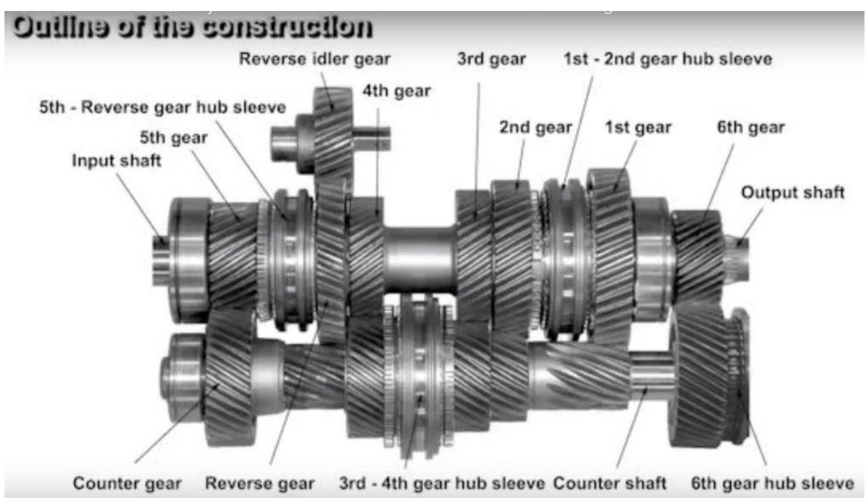
Aim of the experiment:

Study the actual cut section of gear box

Objective: Students will be able to study the internal structure and operations of gear box.

Theory:





Gearbox is a contained gear train, or a mechanical unit or component consisting of a series of integrated gears within a housing. The gears inside of a gearbox can be any one of a number of types from bevel gears and spiral bevel gears to worm gears and others such as planetary gears. The gears are mounted on shafts, which are supported by and rotate via rolling element bearings. The gearbox is a mechanical method of transferring energy from one device to another and is used to increase torque while reducing speed. Gear boxes are used in many applications including machine tools, industrial equipment, conveyors, and really any rotary motion power transmission application that requires changes to torque and speed requirements. a gearbox is always a fully integrated mechanical component consisting of a series of mating gears contained in a housing with shafts and bearings (to support and resolve loads) and in many cases a flange for motor mounting.

Parts of a Gearbox

1. Main Shaft

It is the shaft used as an output shaft in a gear box, this shaft is usually kept parallel to the lay shaft and in front of the clutch shaft or engine output shaft, the change of gear usually occur through this shaft as it is usually connected to the gear lever.

2. Clutch Shaft

It is the shaft which carries the engine output to the gearbox, the engaging and disengaging of the engine output occurs with the help of clutch.

3. Lay shaft or Counter Shaft

It is the shaft through which the output of the engine is transferred to the main shaft by the continuous meshing of gear on the lay shaft to the gear on the clutch shaft.

4. Gears

They are the connecting circles with teeth that rotate and meshes with another gear on the different shaft in order to transmit the circular motion between 2 different shafts, they can be – spur gear, helical gear, bevel gear and worm gear.

5. Synchromesh Devices

They are the special devices used in modern gearbox (synchromesh gearbox) that makes the shifting of gears smooth by bringing the speed of main-shaft, lay-shaft and clutch-shaft at the same, they don't have to slide over the shaft for the shifting of the gear.

6. Dog Clutches

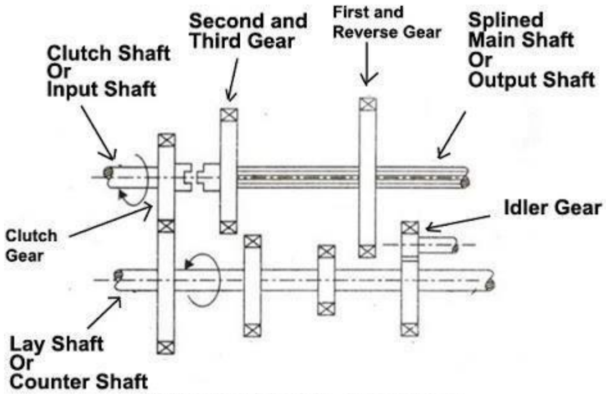
They were used in old gearboxes like constant mesh gearbox, to avoid the sliding of gear over the shaft for meshing or shifting. As they slide over the shaft in order to shift a gear.

7. Gear lever

It is the lever operated by the driver to change or shift the gear; the movement of the lever is designed in a particular fashion.

(i) **Sliding Mesh Gear box**

It is the olds types of gear box used, in sliding mesh gear box the gears of main shaft and lay shaft are not in mesh i.e. independent, only a single gear is in continuous mesh with the gear on the clutch shaft that rotates the lay-shaft and the meshing of gears with the appropriate gear on the lay shaft occurs due to the left or right siding of the gears of the main shaft.



Sliding Mesh Gearbox

Equipment used: cut section of a gear box.

Precautions:

1. Hands must not be put inside the cut section or the cut parts in order to avoid sharp edges.

2. Greasing/ Oiling should be carried out at regular intervals.

Conclusion:

cut section of a gear box is successfully study.

EXPERIMENT NO: 7

Aim of the experiment:

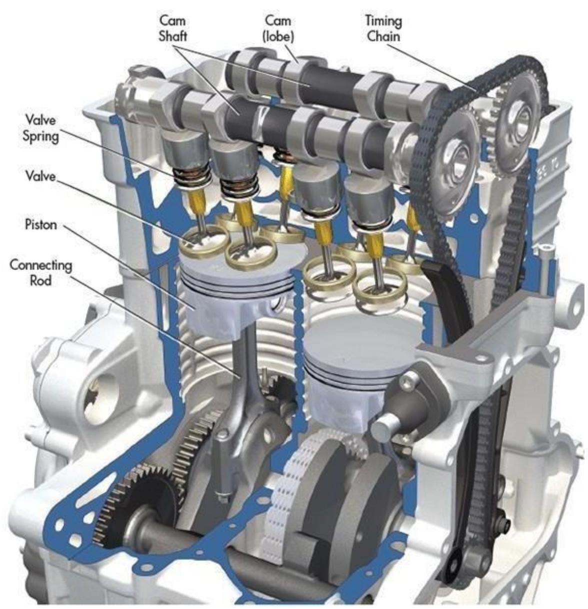
Study of actual car engine

Objective:

Students will be able to understand the working of the engine components and fittings.

Theory:

The term *engine* typically describes devices ,likes team engines and internal combustion engines, that burn or otherwise consume fuel to perform mechanical work by exerting a torque or linear force(usually in the form of thrust). Devices converting heat energy into motion are commonly referred to simply as engine*s*. Examples of engines which exert a torque include the familiar automobile gasoline and diesel engines.



Engine block:

The block is the main part of the engine. All other parts of the motor are essentially bolted to it. Inside the block is where the magic happens, such as combustion.

Pistons:

Pistons pump up and down as the spark plugs fire and the pistons compress the air /

fuel mix. This reciprocating energy is converted to rotary motion and transferred to the tires by the transmission, via the drive shaft, to make them spin.

Cylinder head:

The cylinder head is attached to the top of the block in order to seal the area to prevent the loss of gases. The spark plugs, valves and other parts are fitted to it.

Cam shaft:

The cam shaft opens and closes the valves in perfect timing with there to f the parts.

Crank shaft:

Located n near the bottom of the engine block, this is the part that converts energy from reciprocating to rotary.

Valves:

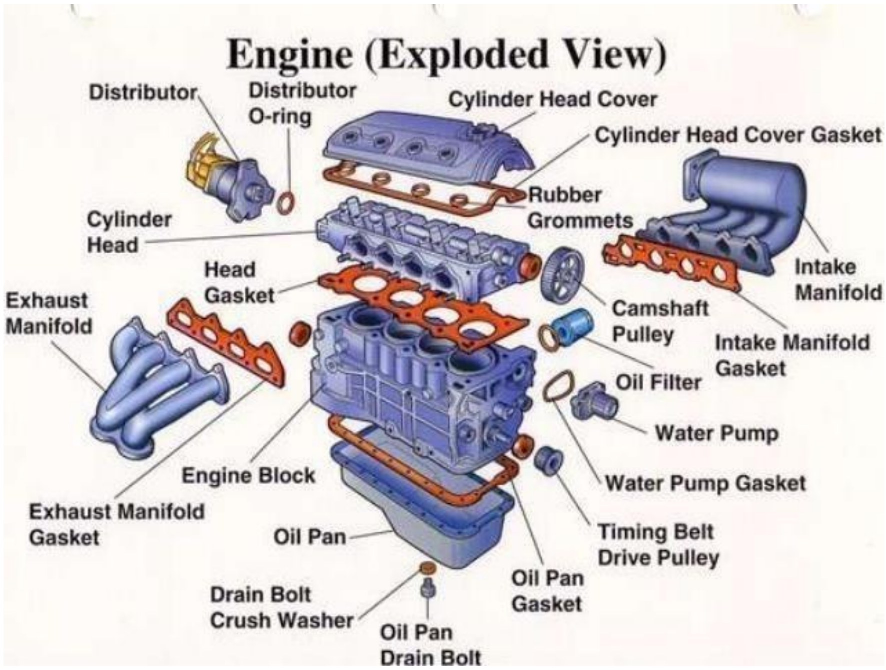
The valves regulate the flow of air, fuel and exhaust fumes inside the cylinder head. There are both intake valves and exhaust valves.

Oil pan:

The oil pan, also known as the oil sump, is attached to the bottom of the engine and stores all the oil used in the lubrication of the engine.

Timing Belt/Chain:

The camshaft and crankshafts are synchronized to ensure the precise timing in order for the engine to run properly. The belt is made of a heavy-duty rubber with cogs to grasp the pulleys from the camshaft and crankshaft. The chain, similar to your bicycle chain wraps around pulleys with teeth.



Equipment used: actual working engine.

Precautions:

1. Hands must not be put inside the cut section or the cut parts in order to avoid sharp edges.

2. Greasing/ Oiling should be carried out at regular intervals.

Conclusion:

actual car engine is successfully study.