BHARTIYA SKILL DEVELOPMENT UNIVERSITY

O.P. Jek. A

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Winter Semester)

B. Voc. Program, I/III/V Semester,

End-Sem. Examination

Course Code: AUT1115 **Time: 2 Hours**

Course Name: Basics of Automobile **Max. Marks: 50**

Instruction:

1. Answer all questions from section A, each question carries one mark.
2. Answer all question from section B, each question carries four marks.
3. Answer all question from section C, each question carries six marks.

Section – A

10X01 = 10 Marks

Q1. The acid used in automobile batteries is

A. Hydrochloric acid
B. Hydrofluoric acid
C. Nitric acid
D. Sulphuric acid

Q2. The petrol engines are also known as

A. Spark ignition (S.I.) engines
B. Compression ignition (C.I.) engines
C. Steam engines
D. None of these

Q3. The problems caused by the wheel imbalance are

A. Hard steering and hard ride
B. Poor acceleration and hard steering
C. Steering wheel vibrations and uneven tyre wear
D. Poor acceleration and reduced fuel efficiency

Q4. During braking, the brake shoe is moved outward to force the lining against the

A. Wheel piston or cylinder
B. Anchor pin
C. Brake drum
D. Wheel rim or axle

Q5. The main task of a battery in automobiles is to

A. Supply electricity to the alternator
B. Act as a reservoir or stabilizer of electricity
C. Supply electricity to the vehicle's electrical system at all times while the engine is running
D. Supply a large amount of power to turn the starter motor when the engine is being started

Q6. The service brakes employed in cars are generally operated

A. Mechanically
B. Hydraulically
C. Pneumatically
D. None of these

Q7. The ignition coil is used to

A. Step up current
B. Step down current
C. Step up voltage
D. Step down voltage

Q8. The self-ignition temperature of Diesel as compared to petrol is

A. Higher
B. Lower
C. Same
D. Depends on fuel quality

Q9. The main purpose of an engine's air cleaner is that it

A. Controls the engine's air intake volume
B. Reduces the engine's air intake noise
C. Prevents rain water from entering the engine
D. Prevents dust and other foreign matter from entering the engine

Q10. The main function of a master cylinder is to

A. Adjust the extent of brake pedal free play
B. Boost the force applied to brake pedal
C. Convert brake pedal force into hydraulic pressure
D. Ensure that all the wheel brakes are supplied with the same amount of fluid pressure

Section – B

04X04 = 16 Marks

Q11. What are the various safety measures taken in automobile workshops?

Q12. Explain the working principle of differential.

Q13. Why wheel alignment and wheel balancing are needed in cars?

Q14. How does car AC works?

Section – C

04X06 = 24 Marks

Q15. Explain the working of the Petrol Engine with the help of a suitable figure.

Q16. Explain the working principle of the Starter motor used in automobiles.

Q17. Explain the working and construction of the gearbox.

Q18. Give the difference between FWD and RWD vehicles.

Ak. Set A

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Section – B

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Q11. What are the various safety measures taken in automobile workshops?

ANS: Safety Requirements for Auto Repair Shop

- Clean-Up the Spills Immediately
- Sweep the Floors Regularly
- Wear Sturdy Work Boots
- Wearing Proper Work Gloves
- Appropriate Eye Wear
- Wearing Workshop Apparel
- Dispose of the Waste Correctly
- Proper Electrical safety

Q12. Explain the working principle of differential.

ANS: Differential functions is to reduce the speed received by the propeller shaft to produce a great moment and to change the direction of rotation of the propeller shaft 90 degree is transmitted to wheel next round through the rear axle shaft rear separately. However, if the differential is not working then it will result in the vehicle which cannot be run.

The basic principle of the differential gear unit can be understood by using equipment that consists of two gears pinion and rack. Both racks can be moved in the vertical direction as far as the weight rack and slip resistance will be lifted simultaneously. Placed between the tooth pinion rack and pinion gear connected to the braces and can be moved by these braces. When the same load "W" placed on each rack then

braces (Shackle) are pulled up the second rack would be lifted at the same distance; this will prevent the pinion gear does not rotate. But if a greater burden placed on the left rack and pinion buffer will then be drawn up along the gear rack rotates the load gets heavier, which is attributed to differences in prisoners who are given the pinion gear, so the smaller the burden will be lifted. The raised rack spacing is proportional to the number of turns pinion gear. In other words that rack gets custody larger still and while prisoners who received a smaller load will move. This principle is used in the planning of differential gears.

Q13. Why wheel alignment and wheel balancing are needed in cars?

ANS: Alignment refers to an adjustment to a vehicle's suspension – the system that connects a vehicle to its wheels. It is not an adjustment of the wheels or tires themselves. The key to proper alignment is adjusting the angles of the tires, which affects how they make contact with the road.

When checking your alignment, a mechanic is mainly concerned with three things:

Camber – This is the inward or outward angle of the tire when viewed from the front.

Toe – Toe alignment is the extent to which tires turn inward or outward when viewed from above.

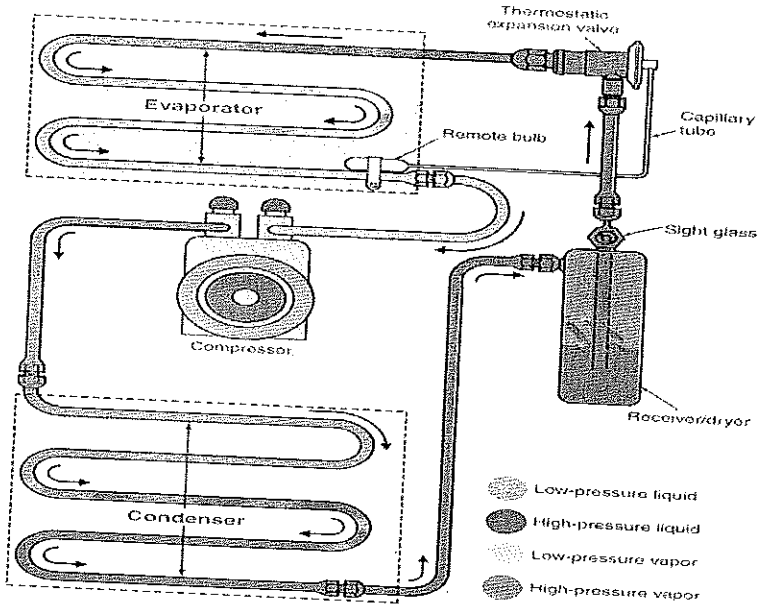
Caster –caster angle helps balance steering, stability, and cornering. Improper wheel alignment and balancing can cause issues with how the vehicle handles. Besides being a safety hazard, it negatively affects tire tread and stability, markedly reduces your vehicle's fuel efficiency, and greatly affects the overall performance of vehicle.

Q14. How does car AC works?

ANS: A car air-conditioner works on the same principle as your room air-conditioner or a refrigerator. The fundamental principle involved is heat-exchange. A refrigerant gas (now commonly used is R134-a) that forces the transformation of liquid to gas and back to liquid, and in the process, it absorbs or releases heat. Heat is absorbed when it expands (from liquid to gas form).

The compressor of an AC, compresses the low-pressure gas into high-pressure, heating it up in the process. The condenser and the fan force this gas to cool down, turning it into a high-pressure liquid form, losing some of the heat in the process. This liquid high-pressures refrigerant flows through an expansion valve just before it enters the cabin, allowing it to expand, reducing pressure and further cooling it down. The above mentioned cold liquid flows through the internal condenser or cooling coil, where it absorbs heat from the cabin as it evaporates into gaseous form. A blower

motor pushes that cold air into the cabin, where it is compressed into a high-pressure gas and the cycle repeats itself.



Section – C

04X06 = 24 Marks

Q15. Explain the working of the Petrol Engine with the help of a suitable figure.

ANS: The working of the 4-stroke petrol engine comprises of following 4 important strokes.

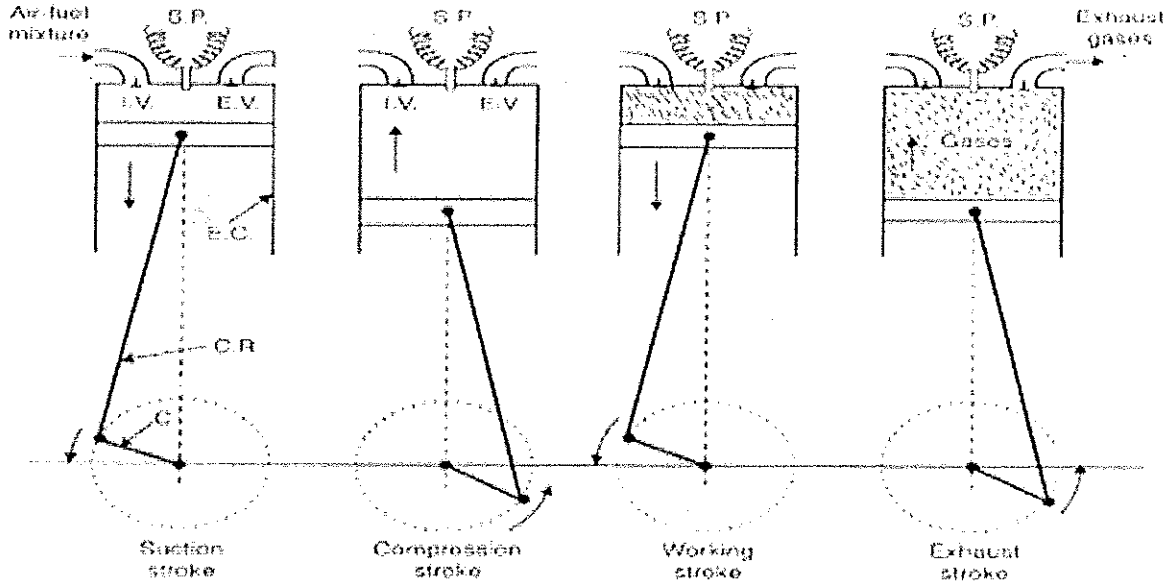
1) Suction Stroke:- While suction stroke, the piston moves from TDC to BDC with the intake valve is in open condition and the exhaust valve in closed condition. During this stroke, as the piston moves from TDC to BDC, a partial vacuum is created inside a cylinder that helps to suck (pull) the air-fuel mixture from the intake manifold into the cylinder.

At the end of the suction stroke when the piston reaches the BDC, the inlet valve becomes closed.

2) Compression Stroke: – During the compression stroke, the piston compresses the air-fuel mixture to high pressure inside the cylinder. For this purpose, the piston moves from the BDC towards TDC. During a compression stroke, both valves (Inlet and Exhaust) remain in a closed condition. At the end of the compression stroke, the spark plug produces the spark to ignite the air-fuel mixture.

3) Power Stroke / Expansion Stroke: - It is a stroke, in which power is obtained from the engine by the expansion of combustion products. It is also called an Expansion Stroke because due to the burning of fuel, High-pressure gases expand inside the cylinder and force the piston downwards. During power stroke piston moves from the TDC towards BDC. At the end of the power stroke, the exhaust port opens.

4) Exhaust Stroke: - In Exhaust stroke, the piston moves from BDC to TDC. During this stroke, burn gases are released to Exhaust Pipe through an exhaust port. The exhaust valve closes when the exhaust stroke is completed.



I.V = Inlet valve, E.V. = Exhaust valve, E.C. = Engine cylinder, C.R. = Connecting rod
C = Crank, S.P. = Spark plug.

Q16. Explain the working principle of the Starter motor used in automobiles.

ANS: The working of a starter is quite easy . When the ignition key or bottom is press, the transmission should be in park or neutral state. The battery voltage goes to through the starter control circuit to activates the solenoid.

The starter motor is powered by the solenoid, which helps to push the starter gear forward to mesh with the engine flywheel. This flywheel is mounted on the engine crankshaft, so as the starter motor spins it turns the flywheel so as the crankshaft. As soon as the engine start, the system disengages from the flywheel. The working inside the starter motor, there are four field windings attached to the housing from inside. The armature (rotating parts) is connected through the carbon brushes in series with the field coils. There is a small gear at the front of the armature attached with an overrunning clutch.

Parts of Starter Motor

Below are starter motors parts and their functions:

Armature:

An armature is an electromagnet component that is mounted on the driveshaft or bearings for a guide. It is made of a laminated soft iron core which is wrapped with numerous conductor loops or windings.

Commutator:

A commutator is a section of the shaft at the rear of the housing on which brushes run to conduct electricity. It is made of two plates mounted to the axle of the armature, the plates provide connections for the coil of the electromagnet.

Brushes:

Brushes are parts that run on a section of the commutator at the rear of the housing. it rubs the commutator and conducts electricity.

Solenoid:

The solenoid features two coils of wire that are wrapped around the core. This solenoid serves as a switch that connects and close the electrical connection between the starter motor and the vehicle's battery.

Q17. Explain the working and construction of the gearbox.

ANS: A gearbox consists of gears of varying sizes, because of the different demands in times of the torque needed at the wheels depending upon the road, load, and terrain, for example; climbing vehicles require higher torque than driving on a straight road.

The first gear is larger compared to the other gears, provides maximum torque outcome while generating minimum speed.

The gears vary size from first to the last in decreasing ratio, thus it empowers varying combinations in pulling ability and speed.

Steps involved in the working of Gearbox:

The constant-mesh gearbox includes a drive shaft connected to a gear which is messed with a gear mounted on a layshaft.

The layshaft includes various gears, arranged with the gears of the mesh.

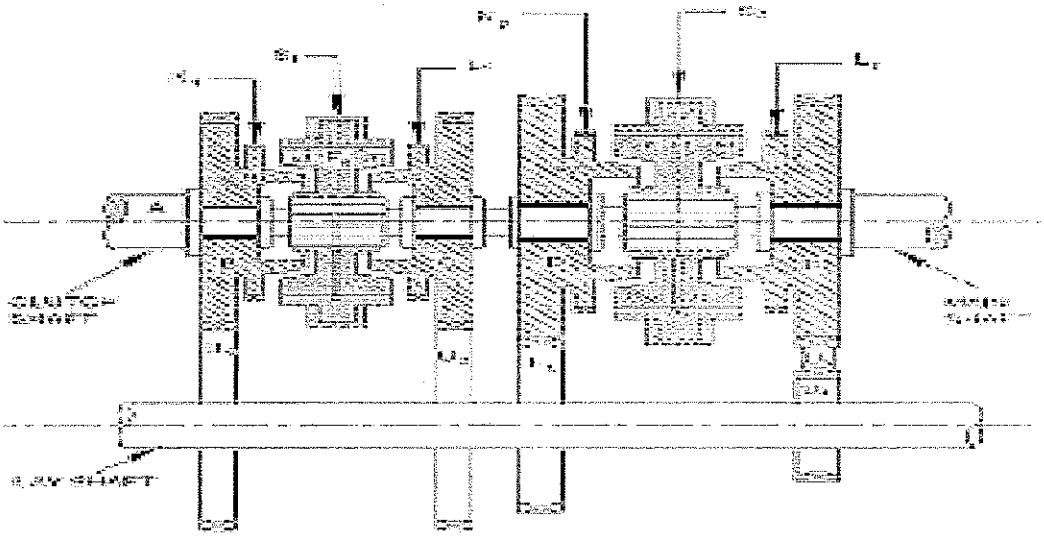
The gears are not directly linked to the main shaft and can be rotated freely around it.

Dog clutches are used to engage the gear and also are splined to the primary shaft, which helps in the rotating process.

The Dog clutches are also assigned with the frictional material which helps them to connect with the gear on the main shaft.

When the driver pushes the gear stick, the selector fork moves the interconnected dog clutch to engage with a gear.

As a result, the clutch and the main shaft rotate with the speed of the gear selected.



Q18. Give the difference between FWD and RWD vehicles.

ANS: Rear wheel drive (RWD), that is the engine was typically in the front, the transmission right behind it, with a drive shaft running back to rear axle to drive the rear wheels. Front wheel drive (FWD), on the other hand, features the engine under the hood in combination with the transmission (sometimes referred to as the transaxle) that directly delivers power to the front wheels.

Each system has its unique advantages. Front wheel drive makes for a very compact engine compartment, with minimal intrusion into the interior cabin of the vehicle (no large hump for the driveshaft, now just a smaller hump to route exhaust, fuel lines, etc. in a more protected area. Front wheel drive also has certain advantages when the roads get slippery or icy. First, the bulk of the weight is over the front (driving wheels) which assists with traction. The other is that power is being put to the road in the same direction that you're steering. With a rear-wheel drive vehicle, the front tires might be initiating a turn but the rear wheels are still pointed straight ahead. Excessive application of power at this point could cause a spin.

Rear wheel drive is most commonly found on sports cars and performance sedans. Rear wheel drive is used exclusively in all categories of motorsport where it's allowed. It's considered the driver's performance as a trained and experienced driver can utilize the power being put down by the rear wheels to help steer the car through turns.

A rear-wheel-drive car of the same weight, power, gearing, and tire size and type will accelerate faster than an FWD car, as the weight of the vehicle is transferred off the front wheels and onto the rear wheels to improve traction. FWD cars typically lose traction in these situations.

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Section – A

10X01 = 10 Marks

Q1. In a single dry plate clutch, torsional vibrations are absorbed by

A. Coil springs
B. Cushion springs
C. Central hub
D. Clutch pedal

Q2. The correct flow of power through the drive train is

A. Engine drive shafts, clutch, main shaft, counter shaft, final driven gear, wheels
B. Engine clutch, main shaft, counter shaft, final driven gear, drive shafts, wheels
C. Engine clutch, countershaft, main shaft, final driven gear, drive shafts, wheels
D. Engine main shaft, counter shaft, clutch, final driven gear, drive shafts, wheels

Q3. How many cells are used in a 12-volt car battery?

A. 2 B. 4 C. 6 D. 8

Q4. Two advantages of using helical gears rather than spur gears in a transmission system are

A. Strength and cost
B. Strength and less end thrust
C. Noise level and strength
D. Noise level and economy

Q5. Two general types of tires are

A. Tube type and tubeless
B. Solid and tubeless
C. Air and pneumatic
D. Split rim and drop centre

Q6. The positive plates of a lead acid battery has

A. Lead peroxide (PbO_2)
B. Spongy lead (Pb)
C. Lead sulphate ($PbSO_4$)
D. Sulphuric acid (H_2SO_4)

Q7. In a petrol engine, the high voltage for the spark plug is in the order of

A. 1000 volts
B. 4000 volts
C. 8000 volts
D. 12000 volts

Q8. The starter motor is driven by

A. Chain drive
B. Gear drive
C. Flat belt drive
D. V-belt drive

Q9. The clutch is located between the transmission and the

A. Engine
B. Rear axle
C. Propeller shaft
D. Differential

Q10. The main function of the brake fluid is

A. Lubrication
B. Power transmission
C. Cooling
D. None of these

Section – B 04X04 = 16 Marks

Q11. What are the various types of Maintenance used in Automobiles?

Q12. What is the advantage of using a synchromesh gearbox over others?

Q13. Give the difference between a car starter and an alternator

Q14. Why relay is used in cars?

Section – C 04X06 = 24 Marks

Q15. Explain the working of the Diesel Engine with the help of a suitable figure.

Q16. Explain the working of the clutch used in cars.

Q17. Explain the various components of car AC.

Q18. Explain the working of hydraulic brakes in car

A.K. 84B

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04X04 = 16 Marks

Q11. What are the various types of Maintenance used in Automobiles?

ANS: There are Three types of vehicle maintenance namely:

1. Preventive maintenance: Prevention without breakdown or without giving trouble on road some attention or maintenance taken to the vehicle is called as preventive maintenance. It intends to reduce or totally eliminate breakdown and accidents due to mechanical failure and reduces repair cost.

A good preventive maintenance program led to following advantages:

A) Reduce the breakdown of vehicle.

B) Increase safety due to reduced breakdown.

C) Less expenses on repairs.

D) Good control on inventory of spare parts.

E) Lesser number of equipment are required.

2. Breakdown maintenance: Break down maintenance is a attention which is to be provided when the motor vehicle becomes immobilized due to fault created during

running. These faults are started difficulties, puncture, electrical fault, carburettor and fuel supply fault, overheating, fan belting, breakage and accident etc.

3. Periodic maintenance or schedule maintenance: Periodic maintenance or operatives' maintenance is attentions provided to motor vehicles after in operation for a specified time or covered distance.

Q12. What is the advantage of using a synchromesh gearbox over others?

ANS: 1) No need for double-declutching as in the case of a constant mesh gearbox.

2) Smooth engagement of higher gears due to the synchromesh device.

3) Less noisy as helical gears are used.

4) Less vibration.

Q13. Give the difference between a car starter and an alternator

ANS: Following are the difference between Alternator and starter motor

1. Alternator converts mechanical energy into electrical energy whereas Motor converts electrical energy into mechanical energy.

2. The term 'Alternator' indicates it works with Alternating Current only or AC but the motor may be an AC Motor or DC Motor or Universal Motor. AC Motor works with AC supply, DC motor work with DC supply, and universal motor work with both AC and DC supply.

3. Generator or Alternator works on the principle of Fleming's Right-Hand Rule whereas Motor works on the principle of Fleming's Left Hand Rule.

4. Alternator is considered as an electrical power generating device whereas the electric motor is considered as an electrical load.

5. Motor is an inductive load that always causes the low power factor whereas the alternator can cause a leading power factor when its prime mover fails in parallel operation.

6. Alternator generates electricity whereas motor consumes electricity.

Q14. Why relay is used in cars?

ANS: An Automotive Relay is a digital or electromechanical managed switch and it is designed for DC voltages in passenger consolation and retainment systems. It also controls power levels in harsh environments. Generally, relays are electric-powered switch that works with electromagnetism to transform small electric stimuli into large currents. This conversion takes place while an electrical current turns on electromagnets to shape or change the current circuits. Relays are frequently utilized in circuits to lessen the current that flows via the number one control switch.

For Example, the current draw for halogens is an awful lot more than the OEM headlight switches have been designed to carry, thereby setting extra pressure at the headlight switch. This can cause the untimely failure of the switch. The use of relay helps in controlling this.

Section – C

04X06 = 24 Marks

Q15. Explain the working of the Diesel Engine with the help of a suitable figure.

ANS: Working of Diesel Engine can be understood with the help of Figure shown

Suction Stroke: At the start, when the piston moves from TDC to BDC, from intake manifold air enters into the cylinder through the inlet port. During this suction stroke, the inlet valve is open and at the end of the suction stroke inlet valve closes.

Compression Stroke: After suction stroke is done, the piston starts to move from BDC to TDC. During this movement, the piston compresses the air to high pressure inside the cylinder. During Compression, both valves (Inlet & Exhaust) are closed.

Power stoke: After the compression of air, the fuel injector sprays the fuel inside the cylinder, hence fuel gets ignited (catch fire).

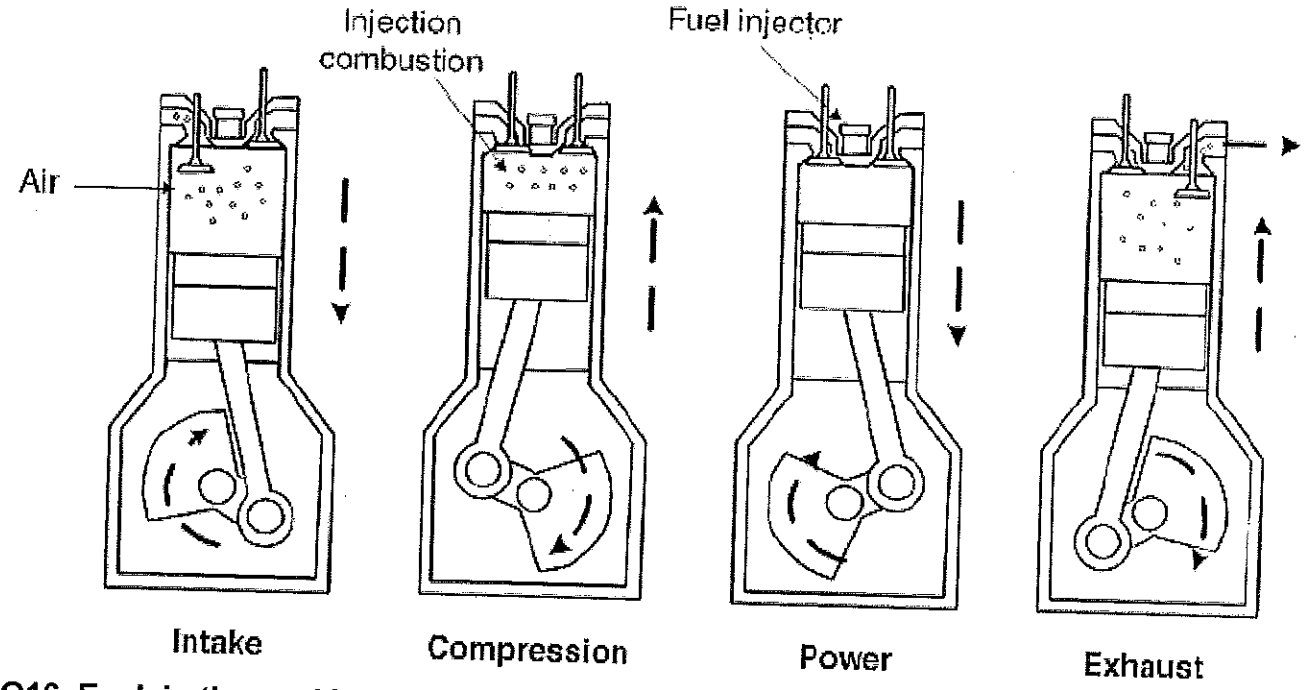
Therefore, Combustion starts, high-pressure gases expand (spread) inside the cylinder and push the piston downwards. During expansion, both valves (Inlet & Exhaust) are closed. Due to expansion stroke, power is obtained from the engine. Hence expansion stroke is also called **a** Power Stroke.

Exhaust Stroke: After expansion stroke, the piston moves from BDC to TDC.

During this movement of the piston (BDC to TDC), the Burnt exhaust gases from the exhaust valve of cylinder are released through the engine exhaust pipe in the environment.

During this exhaust stroke, only the exhaust valve is open and at the end of this stroke, exhaust valve closes and the inlet valve opens to suck (pull) fresh air.Hence in this way cycle continues and power obtains from the engine.

Four-stroke cycle (Diesel)



Q16. Explain the working of the clutch used in cars.

ANS: When two revolving friction surfaces are brought into contact and pressed, then they are united and start to revolve at the same speed due to the friction force between them. This is the basic principle of a clutch. The friction between these two surfaces depends on the area of a surface, the pressure applied to them and the friction material between them.

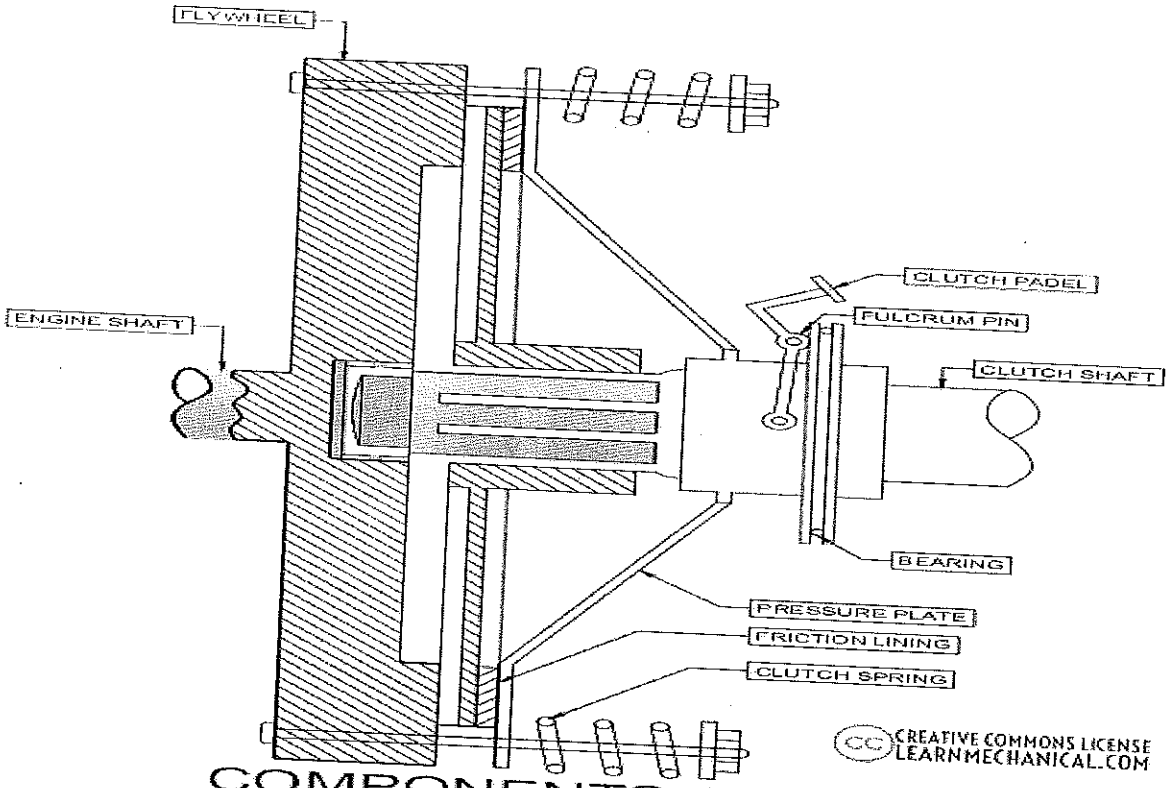
The driving member of a clutch is the flywheel mounted on the engine crankshaft and the driven member is a pressure plate mounted on the transmission shaft.

Some friction plates, sometimes known as clutch plates are kept between these two members. This whole assembly is known as the clutch.

Single plate clutch is mainly used in lightweight vehicles for transmitting torque from an engine to the input shaft. As per the name of this Clutch it just has a single Clutch plate.

The Following Function of an Automobile Clutch:

- It can be disengaged. This allows engine cranking and permits the engine to run without delivering power to the transmission.
- While disengaging, it permits the driver to shift the transmission into various gear according to operating conditions.
- While engaging, the clutch slips momentarily. this provides smooth engagement and lessens the shock on gears, shaft and other parts of an automobile.
- While engaging, the clutch transmits the power to the wheel without slipping, in ideal condition.



COMPONENTS OF SINGLE PLATE CLUTCH

Q17. Explain the various components of car AC.

ANS: Following are the major components of car AC

Compressor: The refrigerant gets turned into liquid by the compressor, which, as the name suggests, compresses that refrigerant. As the gas gets compressed, it heats up, at which point it gets sent to the condenser.

Condenser: The condenser is where the refrigerant gets cooled. This component features a section of coils that air from outside passes over, removing the heat from the compressed gas. This results in the gas cooling and condensing into a liquid state.

Accumulator: The accumulator (also referred to as a receiver-drier) is a canister in the air conditioning system that features a desiccant to absorb moisture. This part may have a sight glass on the top of it, allowing you to observe flow. This is the part that results in the air entering your vehicle having low humidity levels.

Expansion valve: This part restricts the flow of refrigerant, causing it to change from a liquid at high pressure into a low-pressure mist before it goes into the evaporator.

Evaporator: When the mist flows through the evaporator, a blower motor will push the air over the evaporator's cold tubes to create cool air that then gets sent into the passenger compartment of your vehicle.

Q18. Explain the working of hydraulic brakes in car

ANS: The working of hydraulic brakes in car can be easily understood by working of individual components. In hydraulic braking system the parts involved are-

Brake pedal or brake lever- In hydraulic braking system same as other braking brake pedal or brake lever is required by the driver to apply braking, this brake pedal or brake lever is attached with the master cylinder through mechanical rod or connecting rod.

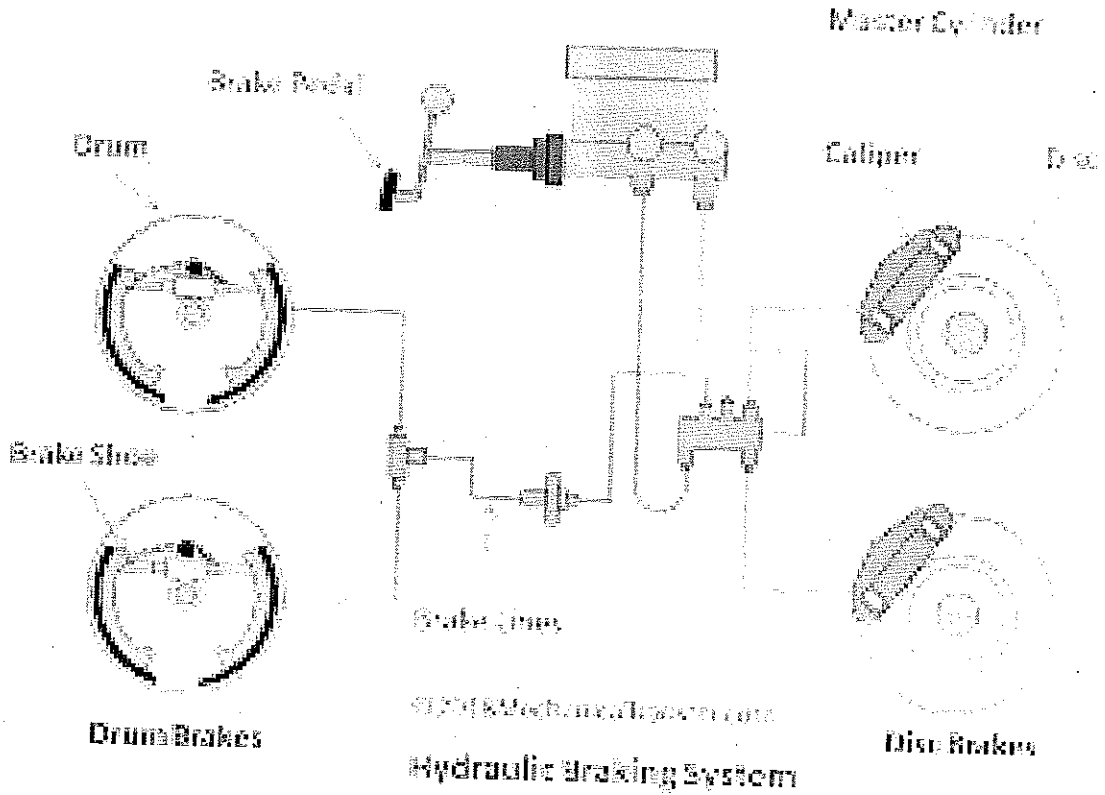
Master cylinder– It is the simple cylinder and piston arrangement, which converts the mechanical force from the brake pedal into the hydraulic pressure. The brake pedal is connected with the master cylinder's piston in such a fashion that the movement of pedal causes to and fro motion of the piston inside the master cylinder.

Brake fluid reservoir – it is the simple reservoir tank containing brake fluid which is connected to the master cylinder with the help of brake hose.

Brake lines- They are the hollow high pressure metal tube that connects the master cylinder with the drum cylinder inside these brake lines high pressure brake fluid from the master cylinder flows which is responsible for further brake actuation.

Drum cylinder- It is the another cylinder fitted inside the drum of the drum brakes and is connected with the brake shoes, the high pressure brake fluid from the brake lines comes to this cylinder.

Brake drum– It is housing of drum cylinder, brake shoes and spring, the outer part of the drum rotates with the wheel and inner part consisting the brake shoe and cylinder remains stationary.



Hydraulic Braking System