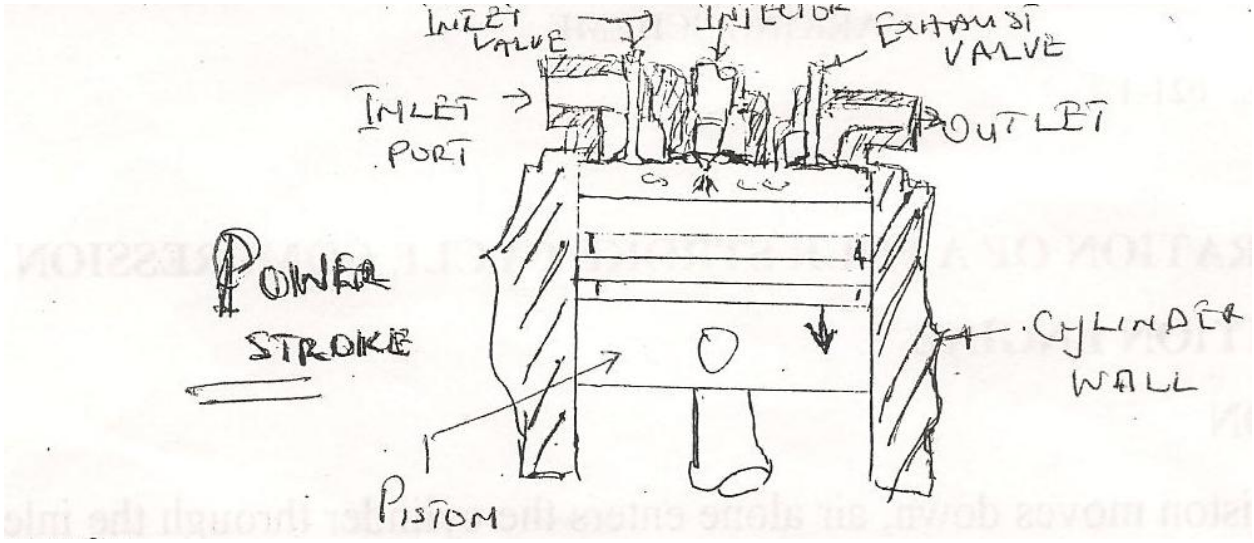
MOTOR VEHICLE MECHANICS –
MAY/JUNE 2008

Q1: OPERATION OF A FOUR STROKE CYCLE COMPRESSION IGNITION ENGINE

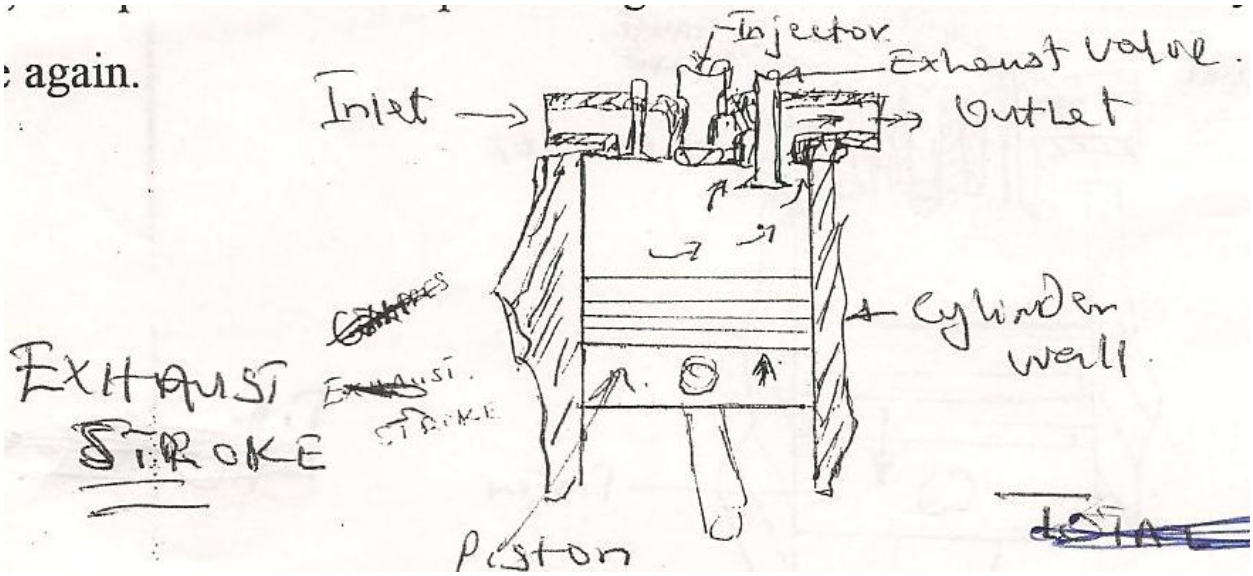
INDUCTION

The piston moves down, air alone enters the cylinder through the inlet valve while the exhaust valve remains closed.



COMPRESSION

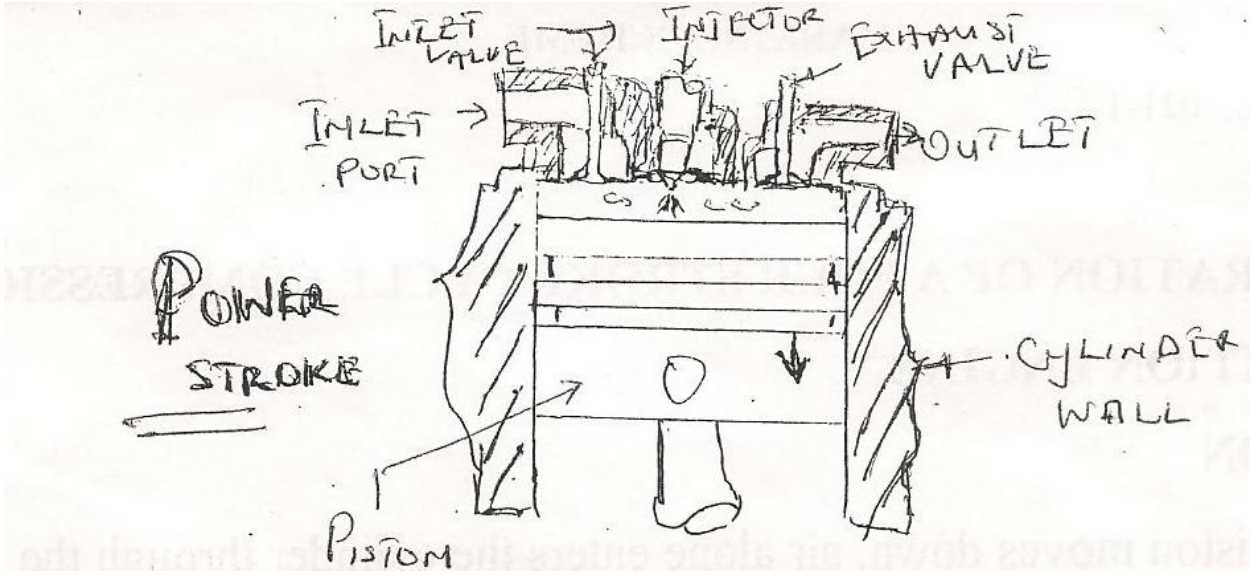
The piston returns with both valves closed, compressing only the air to about sixteenth of it's original volume.



POWER

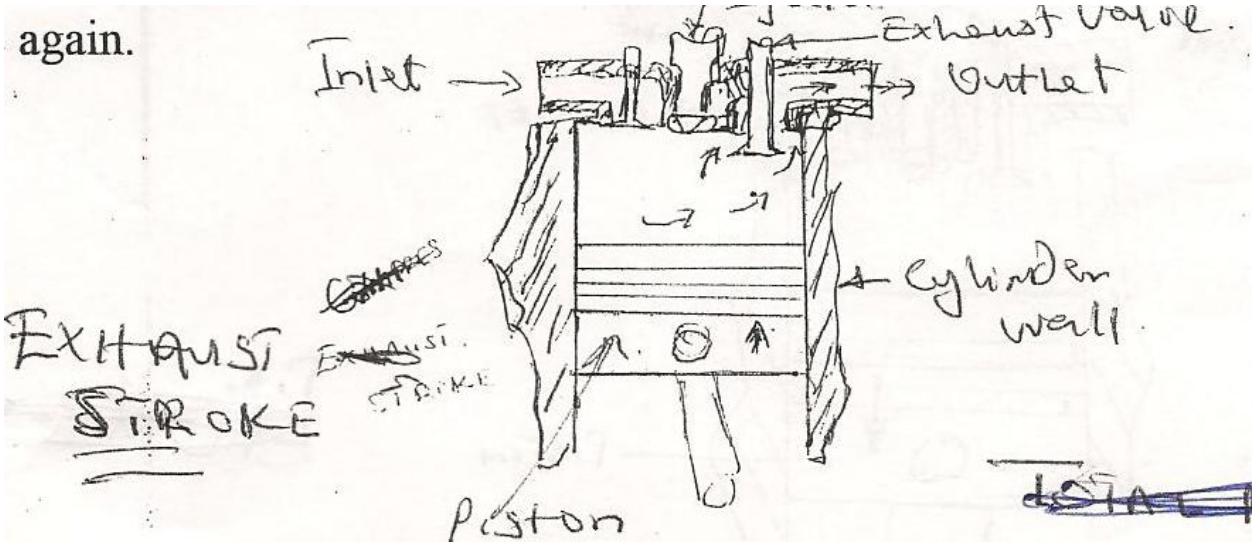
Before the piston reaches the Top Dead Center (TDC) Diesel fuel is injected and commences to burn immediately, while valves remain closed.

Expansion of the air occurs and the piston is forced down the cylinder.

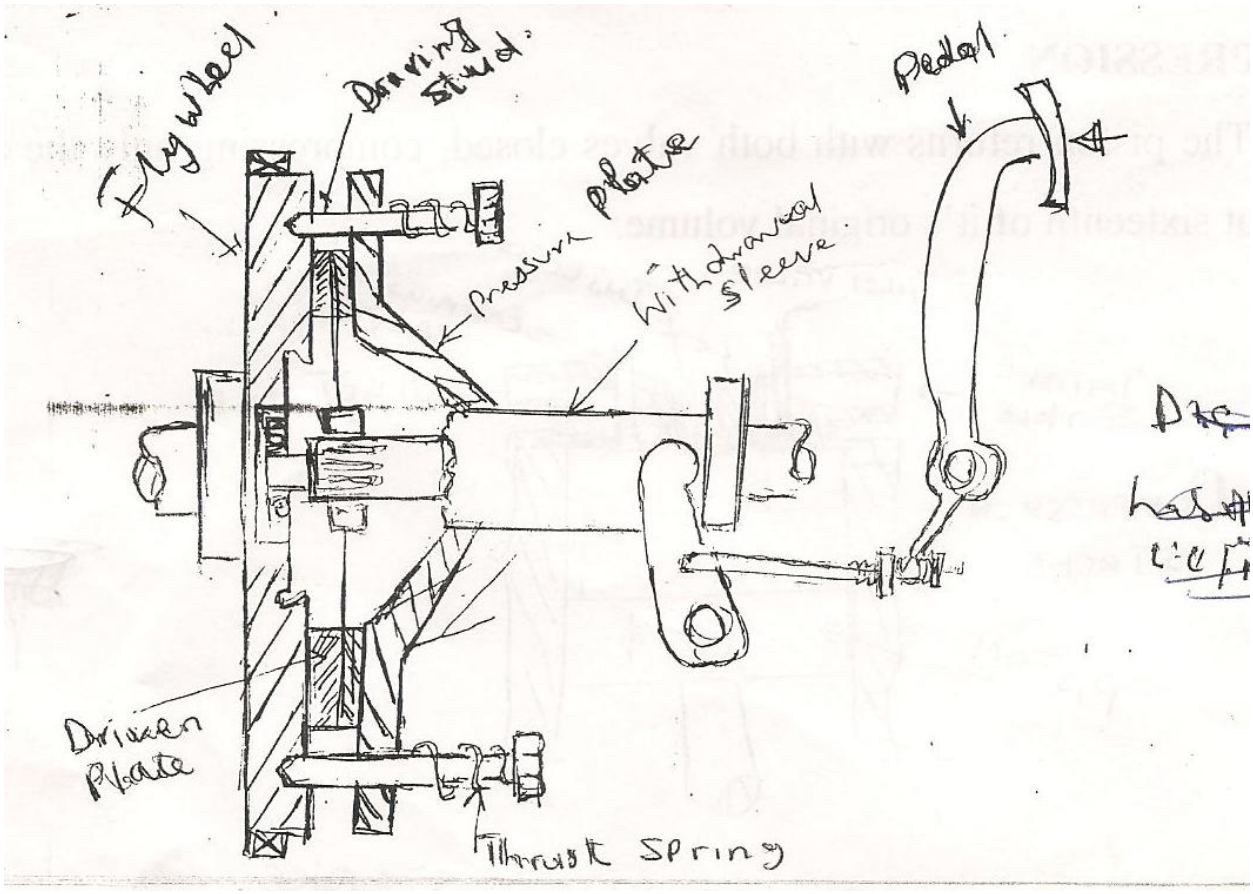


EXHAUST

Before the piston reaches the Bottom Dead Center (B.D.C) exhaust valve opens, the piston returns up. Forcing out the burnt product readily for the next stroke again.



Q2: THE OPERATION OF A SINGLE PLATE. CLUTCH



Above shows a typical diagram of a single plate clutch, when the driver depresses the pedal, the clutch forks push the pressure plate away from the flywheel to remove the spring pressure from the driven plate. With this, the clutch plate is free to run and therefore disengages the engine from the transmission. On releasing the pedal, the spring thrust forces the pressure plate towards the flywheel and mounting pressure on the driven plate and therefore engages the drive.

Q3: FUNCTIONS OF THE PISTON RINGS

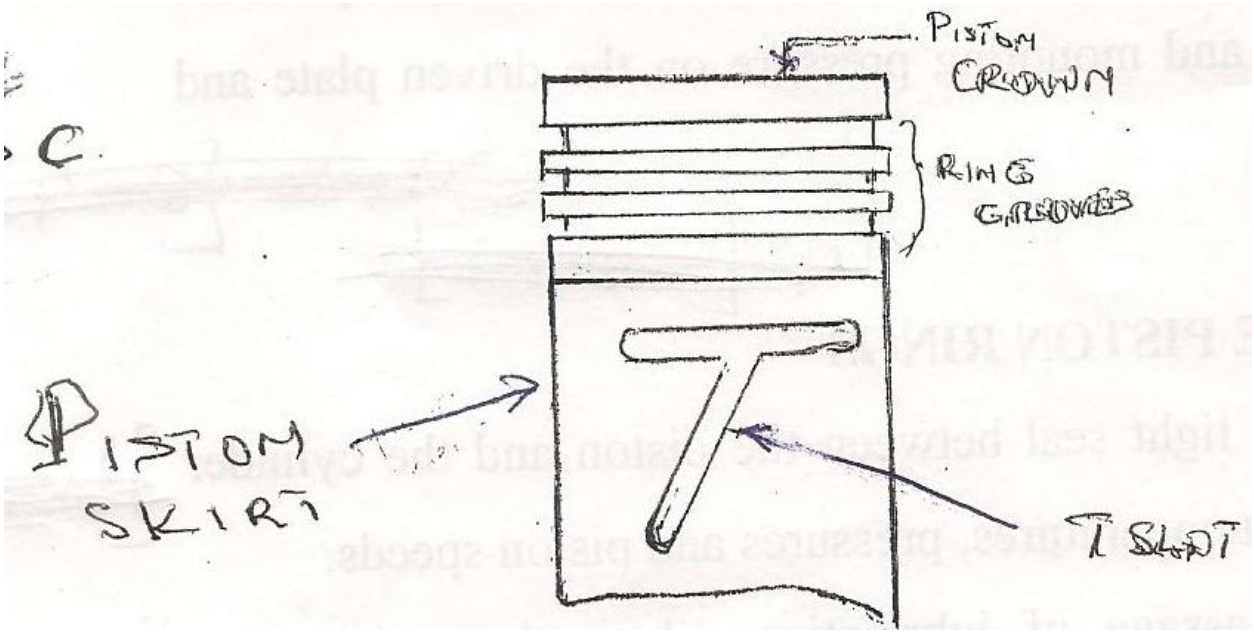
1. To maintain a gas tight seal between the piston and the cylinder wall under normal temperatures, pressures and piston speeds.
2. To prevent the passage of lubricating oil to the combustion chamber.
3. To transfer heat from the piston to the cooled cylinder walls.

3B: FOUR QUALITIES OF PISTON

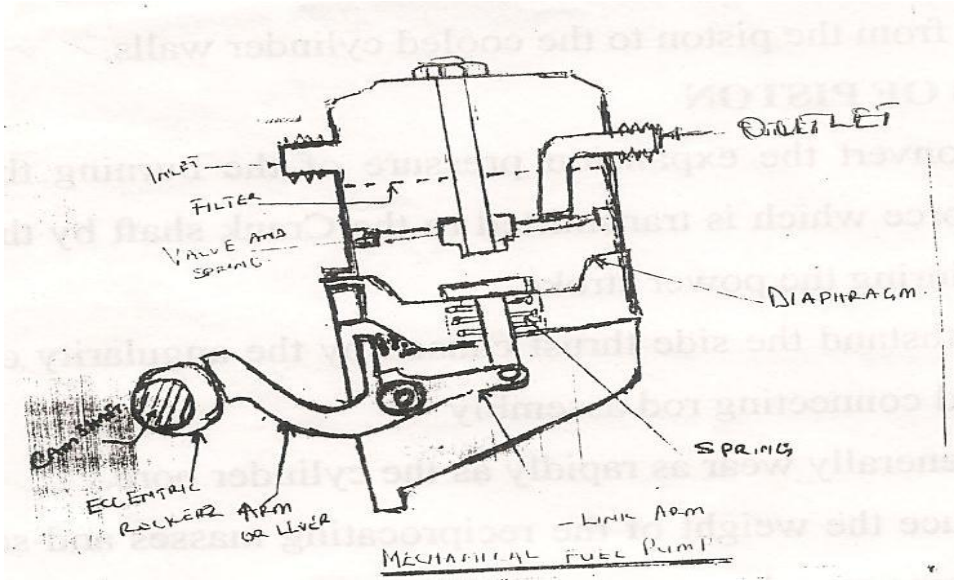
1. It's ability to convert the expansion pressure of the burning mixture into a force which is transmitted to the Crank shaft by the connection rod during the power stroke.
2. It's ability to withstand the side thrust caused by the angularity of the Crank pin and connecting rod assembly.
3. Piston are not generally wear as rapidly as the cylinder bore

4. Lightness to reduce the weight of the reciprocating masses and so enable higher engine speeds.
5. Silent in operations.
6. Correctly formed skirt to give uniform bearing under working condition.
7. Good heat conductivity to reduce the risk of detonation in order to permit higher compression ratio.
8. Rigidity to withstand the higher pressure.

3C.



A: MECHANICAL FUEL PUMP



Q4B:

i. **Sludge** refers to the conditions of by-products of partially burnt fuel together with moisture from condensed-blow by gases combined together and deposited inside the engine Crank Case.

ii. **Flood** refers to the excess of fuel being supplied by the carburetor to the engine as a result of dirt deposited by orifice of the jet or puncture float chamber which results to mal-function of the carburetor.

iii. **dilution:** It refers to the contamination of fuel, dirt and water with the engine oil in the sump.

Q5: SHORT NOTES ON THE FOLLOWING:-

i. **Collapsible Steering Column:-**This is a specially designed steering point along the column in order to take instant squeezing or deformation action shape whenever the vehicle involves in an accident to prevent the driver's chest hitting the steering wheel. This design could be in form of universal joint fulcrum.

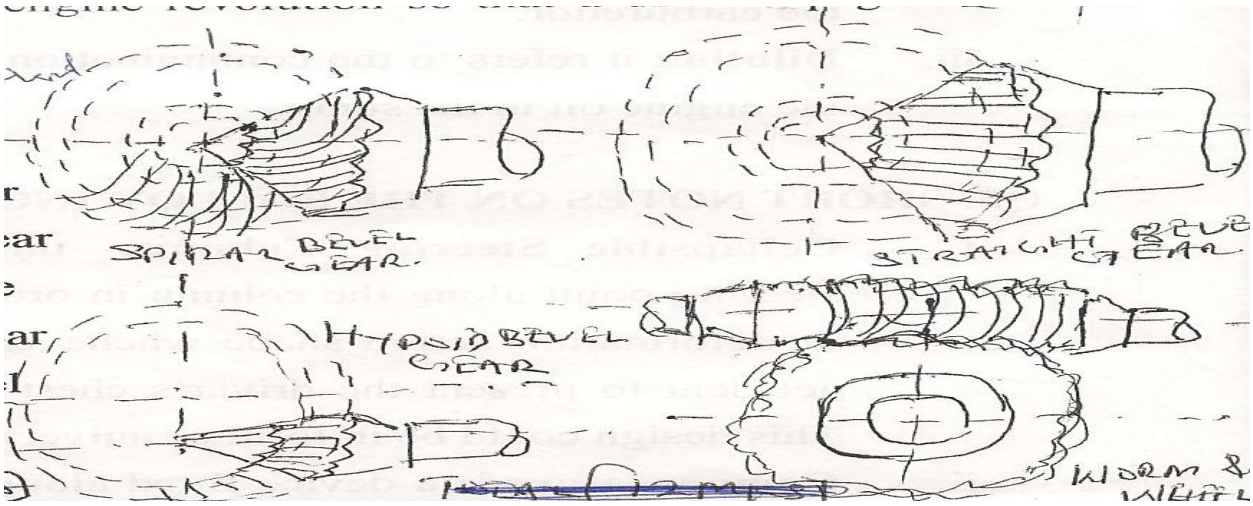
ii. **Compensator is** a device fitted along the mechanically operated braking system usually fitted at the centre of the braking system to allow even efforts or forces to be exerted to both front and rear wheels of a vehicle.

iii. **Pressure Limiting Valve** is a small component fitted along the hydraulic braking pipe line to allow even distribution of fluid pressure to each of the road wheels. It consist of spring loaded valve inlet and outlet valves and it's housing case.

iv. **Steering Wheel Lock:** This is a special arrangement of locking device incorporated along with the ignition key component attached to the steering column. Whenever the ignition key to inserted into the unit and turn the key to lock position, the steering wheel will lock preventing an intruder to turn the wheel.

Q6: TWO FUNCTIONS OF FINAL DRIVE

1. To transmit the drive through an angle 90^0.
2. To slow down the engine revolution so that a direct top gear box ratio may be employed
3. To allow the inner wheel run faster than the outer wheel.



6B

1. Spiral Bevel gear
2. Straight bevel gear
3. Helical gear type
4. Hypoid bevel gear
5. Worm and wheel

Q7: FOUR BASIC PRECAUTIONS TO BE OBSERVED WHEN CHARGING A LEAD-ACID BATTERY

1. The charging room should be well ventilated or open space.
2. Hand gloves must be used.
3. Correct connection of battery polarities must be observed and carried out.
4. Battery plugs or covers must be removed.
5. Battery terminals must be cleaned.
6. Correct level of electrolyte must be observed.
7. Avoid over charging of the battery.

7B: TWO METHODS OF CHARGING A LEAD-ACID BATTERY

1. **Direct charging method ie** with the aid of charging machine connected to the electric power supply.
2. **Alternating method** ie through the Alternator (charging device) in a motor vehicle.

7C: DEFINE THE FOLLOWING

1. **CIRCUIT**:- An electric circuit is an arrangement of electric current sources and conducting paths through which a current can continuously flow.
2. **AMPERES:-** This is the measurement of unit of current flowing through a conductor. Or Ampere is defined as the flow of 1 coulomb of electricity per second.
3. **VOLTAGE DROP**:- This refers to the voltage difference between any two points in an electric circuit or piece of electrical equipment that is carrying current.

FORMULA V=I R.