ME8091 - Automobile engineering.

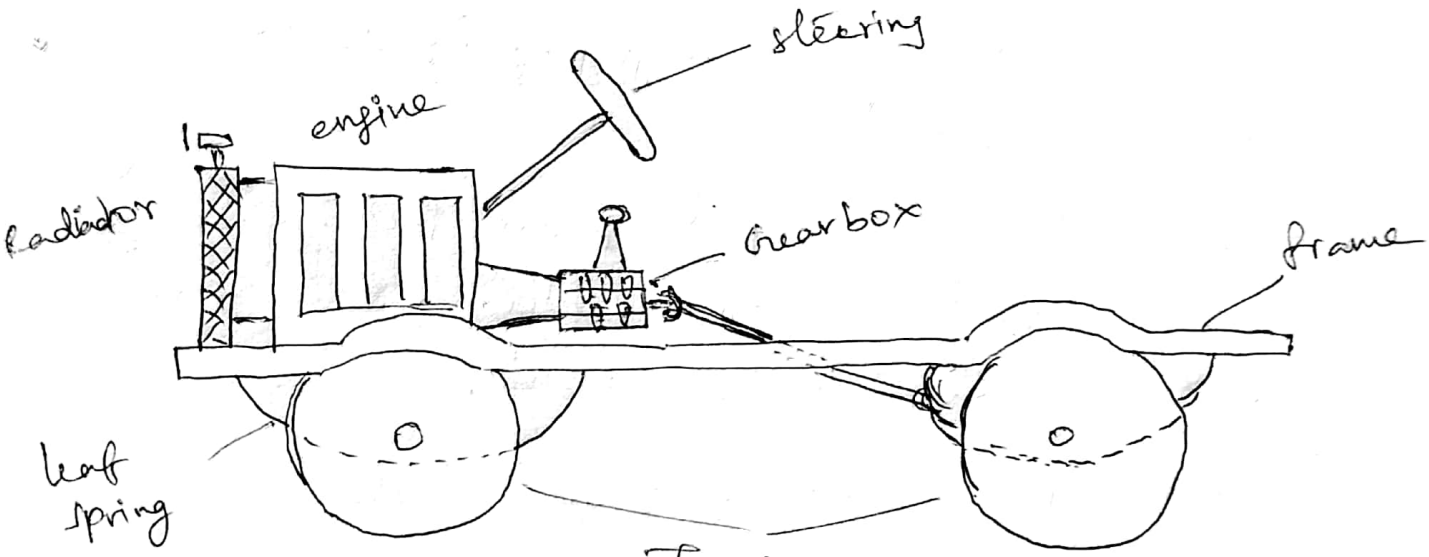
Unit - 1.

Vehicle structure * engine.

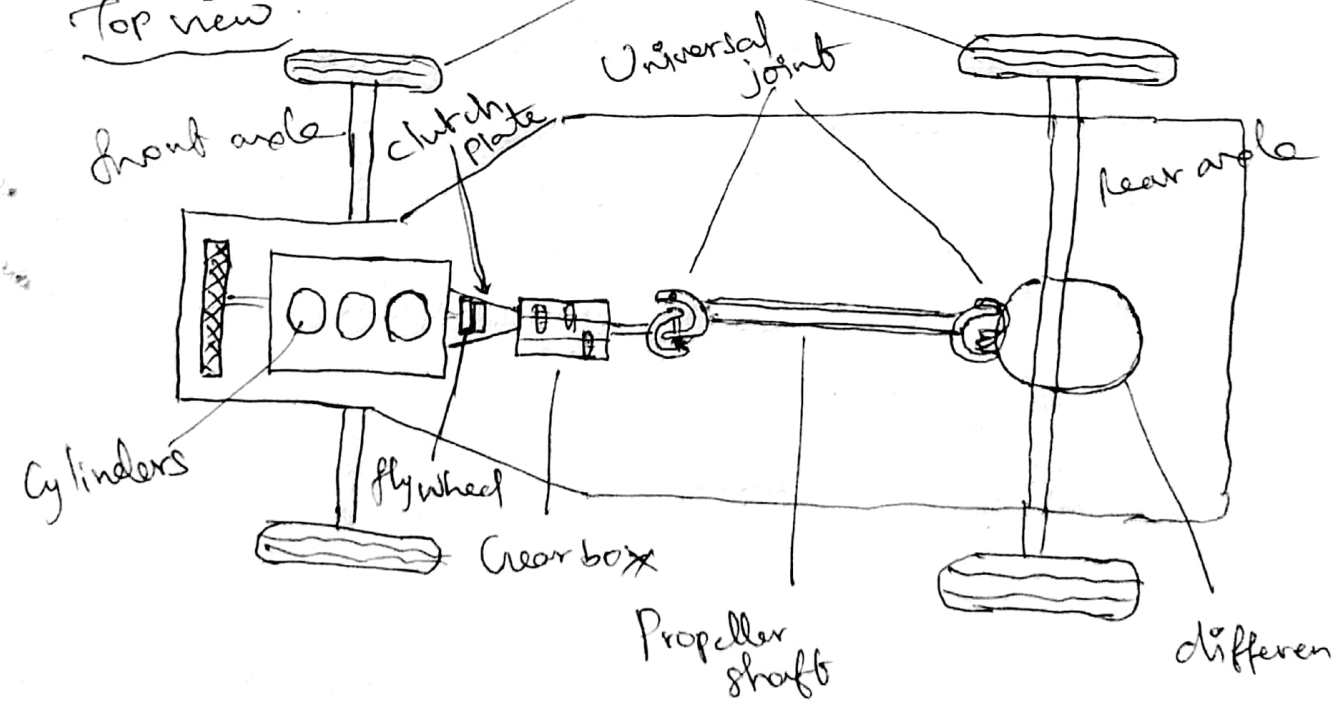
1)) Layout of Automobile chasis. (April/May-2017, M/J-2013)

Various components of chasis. drive system.

Front view.



Top view.



key words.

engine: heart of automobile used to make kinetic energy to mechanical. it is a drive medium.

Radiator: cooling system to cool the over side of engine liner's as while it functioning

frame: longitudinal member to hold all parts of vehicle including engine, body and supporting equipments.

flywheel: whole output from the engine through Crank shaft make some rpm depending upon engine speed.

clutch: Smooth movement of vehicle and to engage with gear box from flywheel.

Gearbox: regulate the vehicle speed as required level by changing of gears

1) sliding mesh 2) Constant mesh 3) Synchromesh

Universal joint: make free flexible movement from one degree to another degree

Propeller shaft: cylindrical long shaft give rotate motion it is a Transfer motion from engine medium to drive medium.

differential

A bevel gear arrangement is to control the rear both wheel while turning and give a driving torque to rear wheels.

Axles.

live and dead axle. differential axle is a live axle & steering axle is a dead axle.

steering. To control the vehicle as required direction by rotating it. Rack & pinion, hydraulic, electronic power steering.

2) Various forces acting on a body & its aerodynamics. (NOV/DEC-2011, may/June. 2013

Aerodynamics.

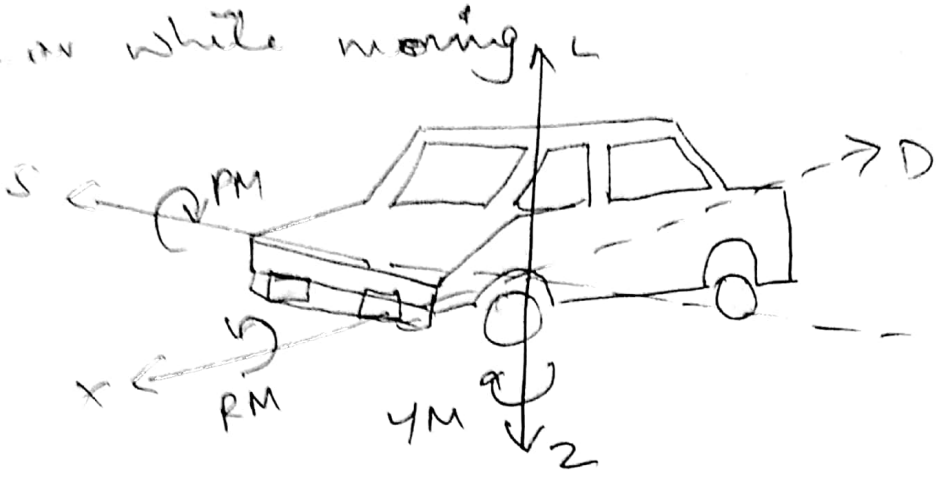
keywords * drag & wind noise,
* Preventing lift force
* instability at high speeds
* Produce down force

design of vehicle body.

1) Reduce fuel consumption
2) more favourable comfort, wind noise, ventilation
3) stability handling

Aerodynamic resistance

a) Drag force (D). - Pushing against front of car while moving



$D = 0.5 \rho C_D A V^2$

ρ - air density, C_D - Drag factor, A - Area of vehicle, V - velocity of air.

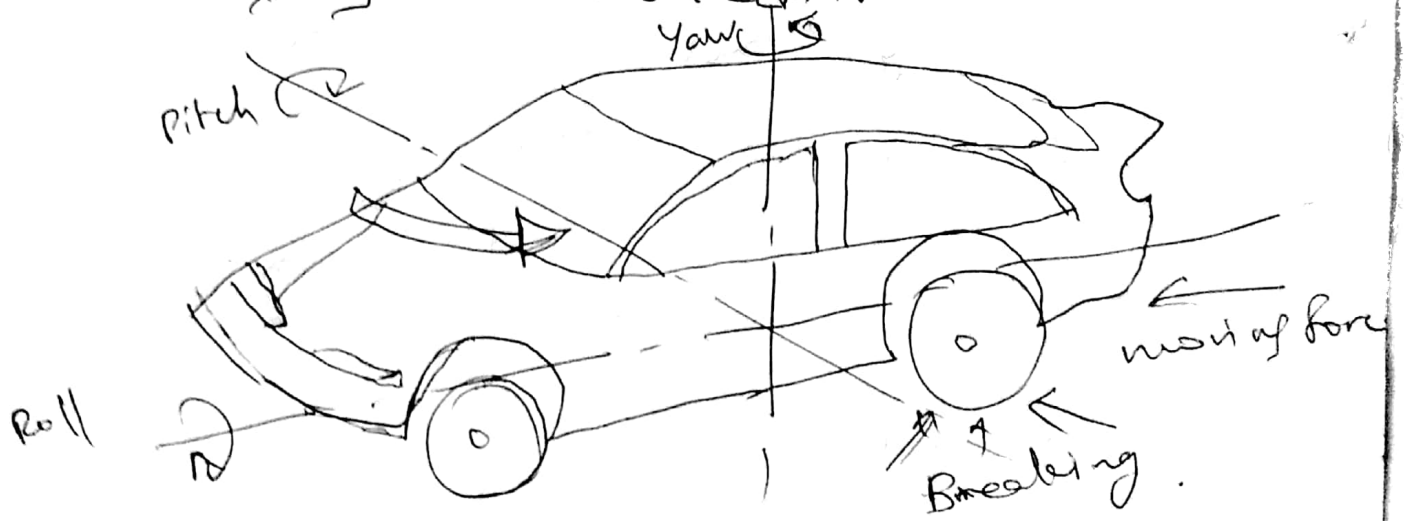
b) Lift force (L)

opposes the weight of an object and raises it into air.

Down-force to press down the ground make friction

front lift force $L = 0.5 \rho C_{Lf} A V^2$

rear lift force $L = 0.5 \rho C_{Lr} A V^2$.



Pitching moment - acceleration/breaking action around Horizontal axis of vehicle. Caused on drag/lift force in (Y axis.)

Rolling moment (X) cornering, side-to-side movenat.

Yawing moment - Spin movement around in vehicle axis (Z)

2) Rolling Resistance

due to friction effect on moving part frictional slip b/w pavement surface & tyre.

$R_{rl} = f_{rl} W$.

f_{rl} - Rolling resistance co. eff

W - weight

3) Grade Resistance - happened in highway moving up a grade. vehicle component act as a downward press. due to opposite of force

$R_g = (W \times G)$

R_g - Grade resistance

W - Gross weight

4) Traction - adhesive friction of tyre to road surface

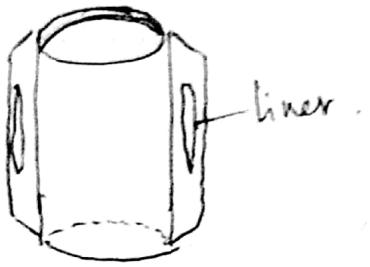
Driving - accelerate

Breaking - slow or stop

Cornering - turn

3) IC engines Components. (April/may-2017, M/J-2014) (6)

1) Cylinder.

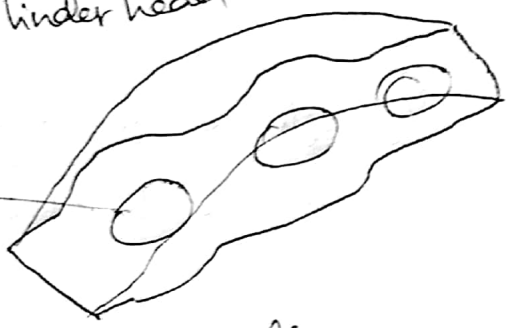


1) Cast iron
2) Casting
3) TDC, BDC.
4) Stroke

2) Piston.

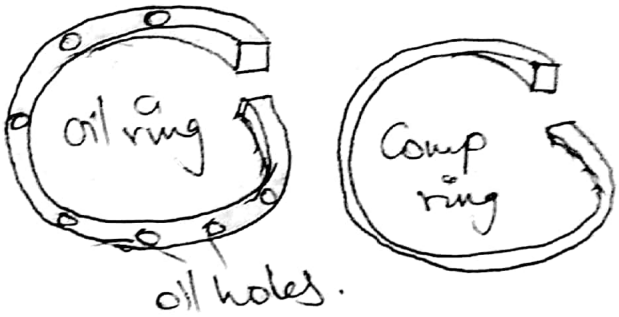
1) light Cylinder
2) Side freely
3) Be strong
4) Al. alloy,
5) light alloy piston
6) Cast iron

3) Cylinder head.



1) Restrict air flow.
2) Create Compression
3) Cast iron, Al

4) Piston ring

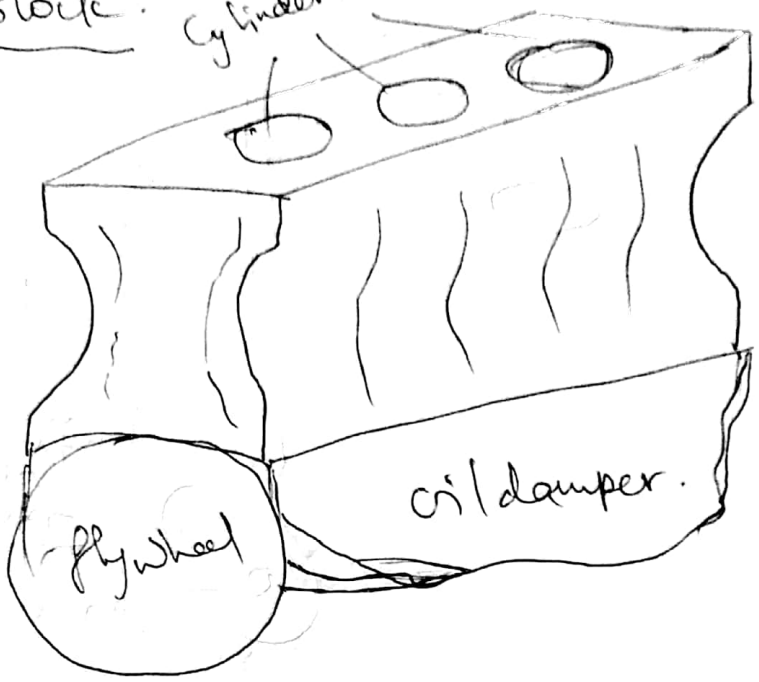


1) Good Sealing
2) expand & contract
3) free moving on Cylinder walls.
4) Cast iron, al. steel

5) Gudgeon Pin

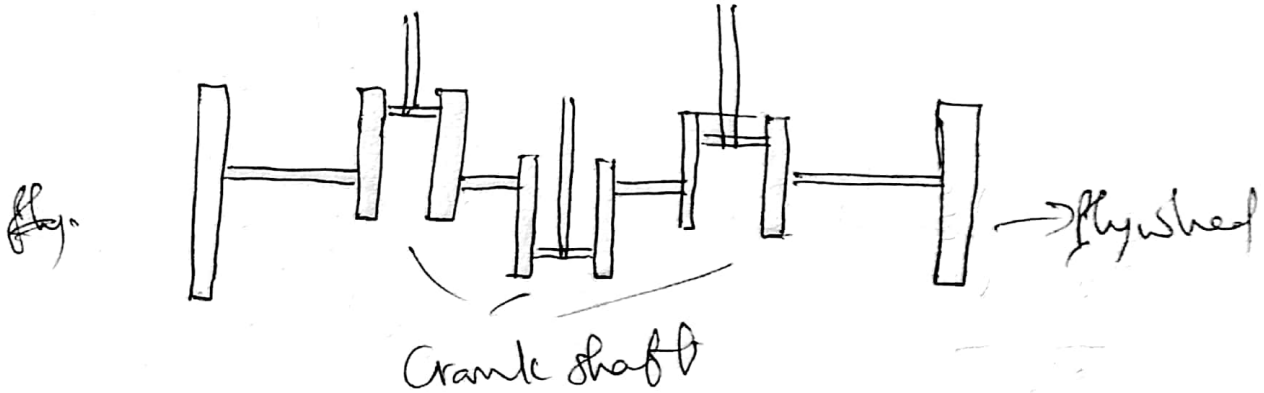
1) lock piston hosts with Connect rod.
2) Press fit.
3) it is a hollow for lightness

5) engine block.



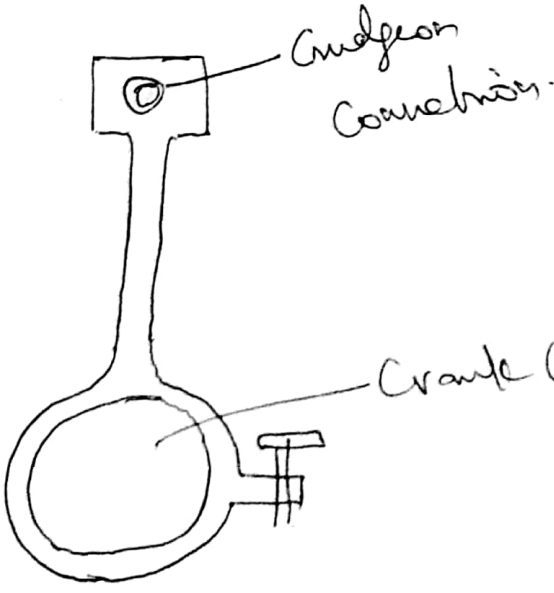
1) Support piston on cylinder.
2) Casting
3) Cast iron

6) Crank shaft



1) forging 2) steel material Connect with Connecting rod.

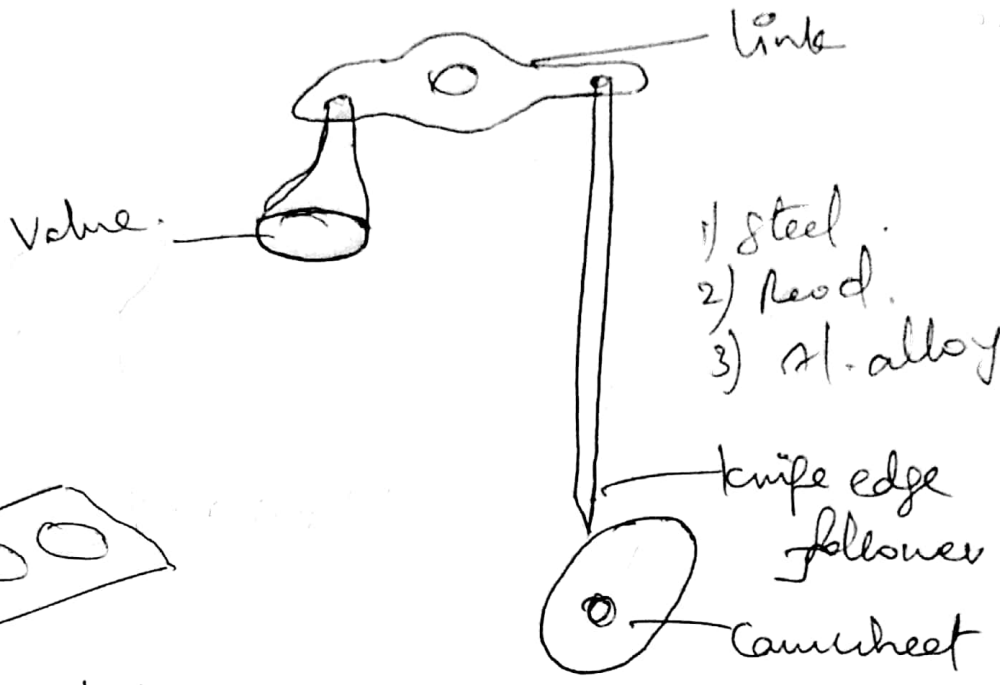
7) Connecting rod.



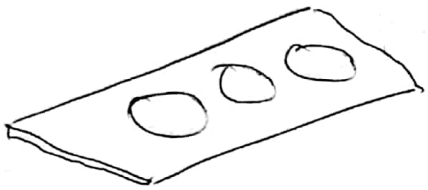
1) Nickel
2) chromium
3) vanadium

Piston load to Crankshaft

8) Camshaft

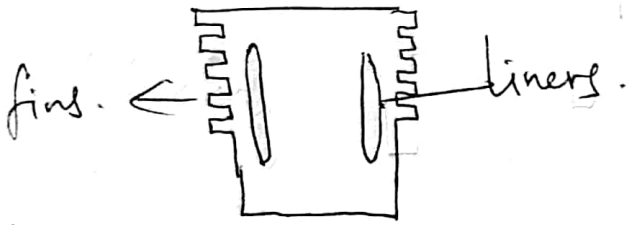


9) Gasket.



1) avoid oil leakage.
2) fitting of cylinder head.

10) Liners



1) Cast iron
2) Cooling water Circulating.
3) Casting.
4) Dry, wet type.

Different method of VVT.

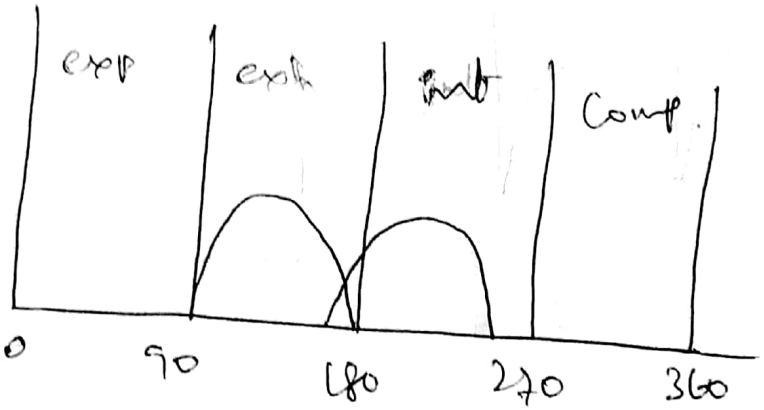
1) Cam changing VVT.

Honda cars in ~~80~~ 1980s. Civic, CRX, NS-X

Advantage: Powerful at topspeed only.

Disad - 2 & 3 stages only.

2) Cam phasing VVT.



1) Simplest
2) Cheapest
3) Commonly used

Advantages improve torque delivery across the whole revol range.

Disadvantages - Lack of variable lift & variable valve opening duration

1) Audi V8 - 2) BMW - double vanos.

3) Cam changing + Cam phasing.

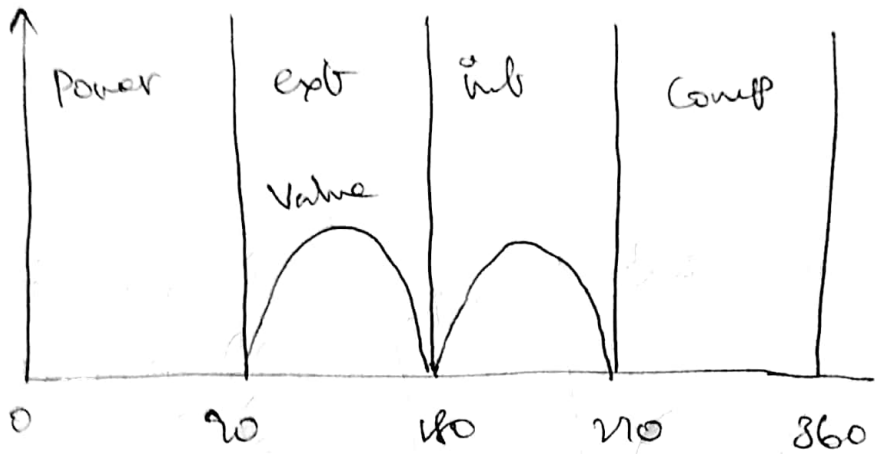
Combining VVT mostly used in Toyota VTL-i

Powerful function

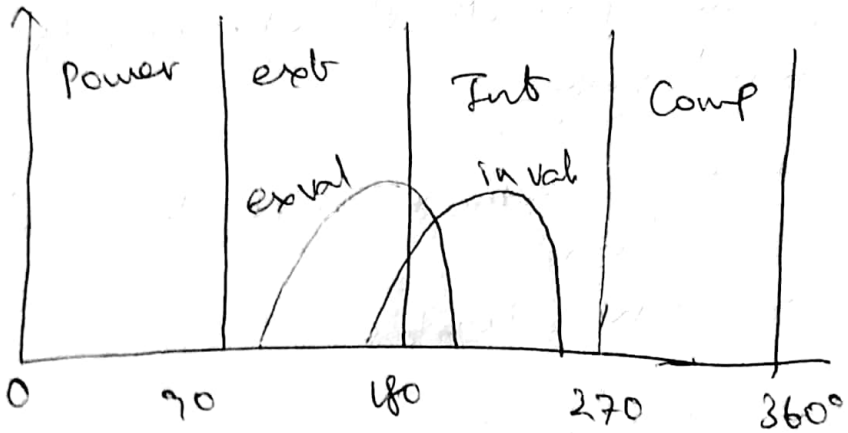
1) Continuous cam phasing
2) 2 stage variable valve lift plus
3) Applied to both intake & exhaust

(1) Variable valve timing. (VT.)

"It is the process of altering the timing of a valve lift event, and is often used to improve performance of fuel economy or emissions.



Normal valve Timing.

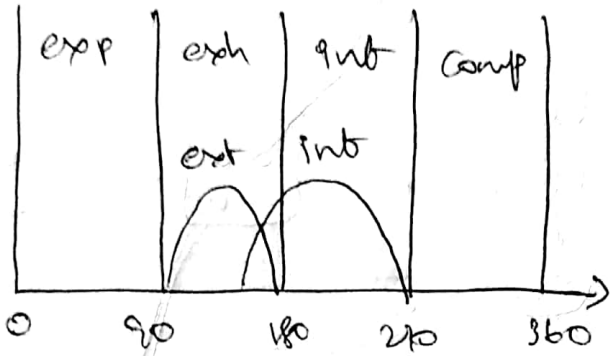


Provides 90% Peak torque blw 2000, -6000 rpm.

Variable valve Timing.

4) Rover's unique.

in 1995 -



1) mechanism serves 2 adjacent cylinder's
2) Rover 1.8 VVC

Adv:- duration of opening achieve both drivability & high speed power.

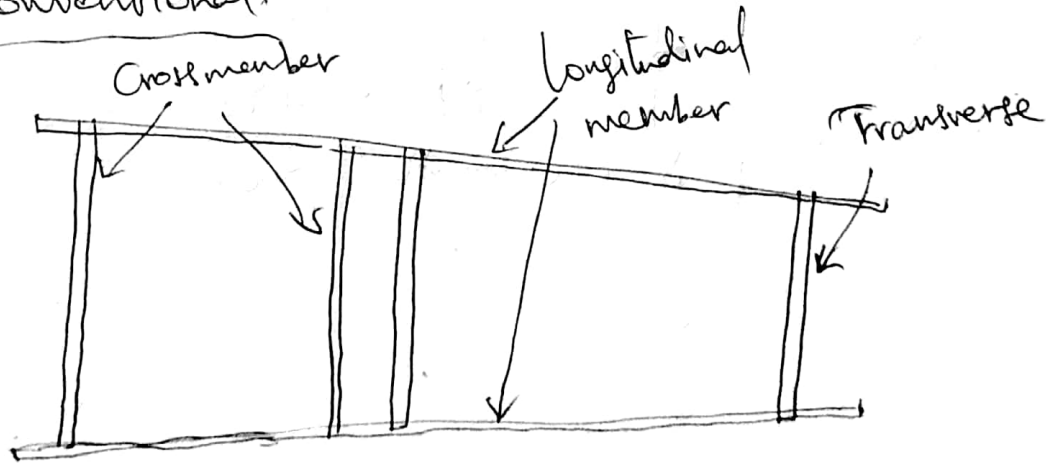
Disadv: Non ultimately as powerful as cam-changing VVT because of lack of variable lift.

---

5) Various Types of frame & it's Section :- NOV/DEC -2011

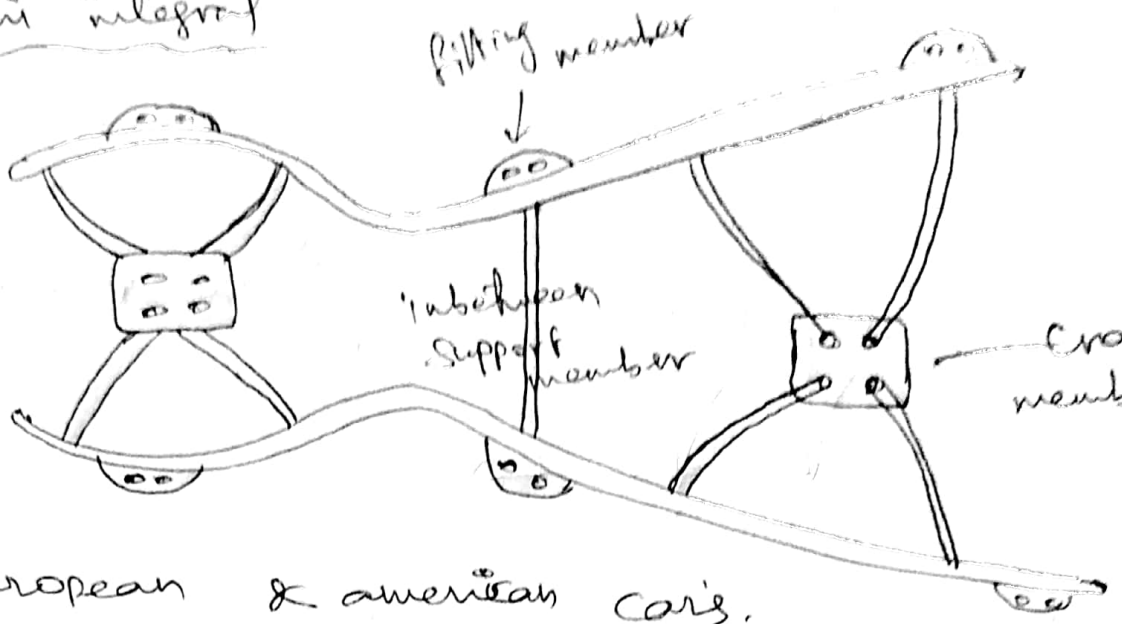
1) Conventional
2) Semi-integral
3) Integral (or) Unit frame

1) Conventional.



1) non load carrying 2) load carrying on Suspension
3) 2 long member & 5-6 crossmember.
4) used in trucks

b) Semi integral



european & american cars.

1) half frame is fixed in the front end.
2) engine gear box & front suspension is fixed
3) easily to replace of members.

c) frameless integral No frame & in car casing Pannel:-

*) decreases over all weight
*) it is a single unit
*) under body is made of floor plates & channel box.
*) used in most of cars.
*) cheap & economical one.

frame Section

1)

Channel. Suited for bending loads.

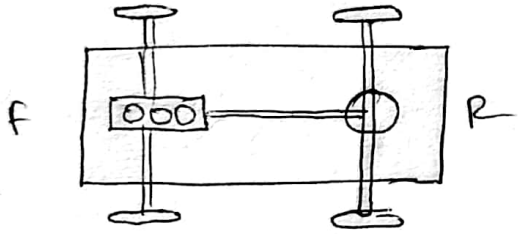
Box. bending & torsion

Tubular. Suitable for torsion.

frame & body are fitted with shock absorber or leaf springs.

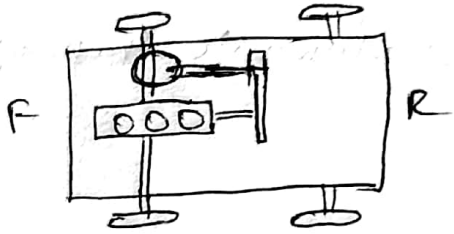
6) Classification of chassis according to drive.

A/M. 2015



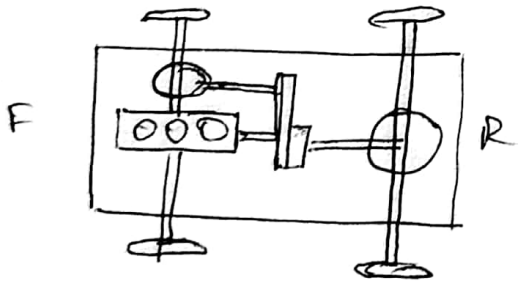
Front engine rear wheel drive

1) high torque.
2) Truck buses.
3) load vehicles.
4) Cylinder Count high



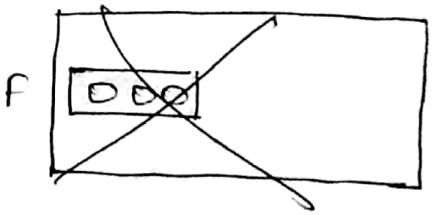
Front engine front wheel drive

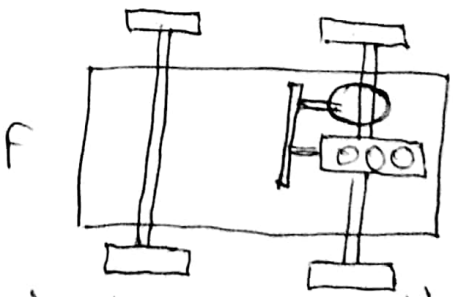
1) high speed cars.
2) Smooth operation.
3) light weight
4) frameless vehicles.



front engine four wheel drive

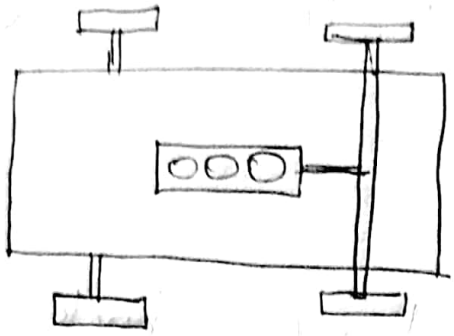
1) off road vehicles.
2) SUV vehicles
3) Jeep cars





3) better Aerodynamic buses.

1) volvo bus. 2) high speed



Centre engine rear wheel drive.

1) CORONA vehicles.
2) Centre weight vehicles
3) Balance stability
4) Aerodynamic increasing.

17