



The Shirpur Education Society's

**R. C. Patel College of Engineering and
Polytechnic, Shirpur**

Department of Mechanical Engineering

NAME OF COURSE: - Automobile Engineering

CODE OF COURSE: - 315372

SEMESTER: - TYME-5K

SUBJECT TEACHER: - Mr. J. N. Chaudhari

CHAPTER No. 1 :- Introduction to Automobile – 16 M



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R. C. Patel College of Engineering & Polytechnic, Shirpur

QUESTION BANK OF CHAPTER – 1

INTRODUCTION TO AUTOMOBILE

Program Name: Diploma in Mechanical Engineering

Program Code: ME

Name of Subject & Code : Automobile Engineering (315372)

Semester : FIFTH

Instructions: (1) Illustrate your answers with neat sketches wherever necessary.

Q.1.	Two marks questions.	Previous Exam	CO PO Mapping
1.	Write any four types of automobile layout	S25-1.a S26-1.a	C01- TL01.3-U
2.	Define. Automobile, list major components of vehicle.	W25-1.a	C01- TL01.1-R
3.	State advantages of front Engine front wheel drive vehicle layout	W25-1.c	C01- TL01.4-R
4.	State the function of chassis	S26-1.d	C01- TL01.5-R
5.	State functions of transmission system in automobile.	W25-1.g	C01- TL01.1-R
Q.2.	Four marks questions.	Previous Exam	CO PO Mapping
1.	Give the classification of automobiles.	S25-2.a	C01- TL01.2-U
2.	Write any four advantages of front engine rear wheel drive.	S25-3.a	C01- TL01.4-U
3.	With neat sketch explain front Engine Rear Wheel Drive Layout.	W25-2.a	C01- TL01.3-A
4.	Explain in detail different load active on Chassis frame.	W25-5.c	C01- TL01.6-U
5.	Draw & explain layout of electric vehicle? State its advantages & disadvantages.	W25-6.a	C01- TL01.7-U
6.	Draw general layout of front engine front wheel drive car.	S26-2.a	C01- TL01.3-A
7.	Explain different types of automobile Chassis.	S26-3.a	C01- TL01.5-A
8.	state and explain different forces acting on the vehicle body related to aerodynamics.	S26-6.b	C01- TL01.6-A
9.	List components of vehicle counted in sprung and un-sprung weight.	S26-4.a	C01- TL01.1-R



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10.	Justify, "Aerodynamic shape of an automobile improves performance of vehicle".	W25-3.a	C01- TL01.6-U
* **Best of Luck** *			

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04/07/26

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* Automobile Engineering *

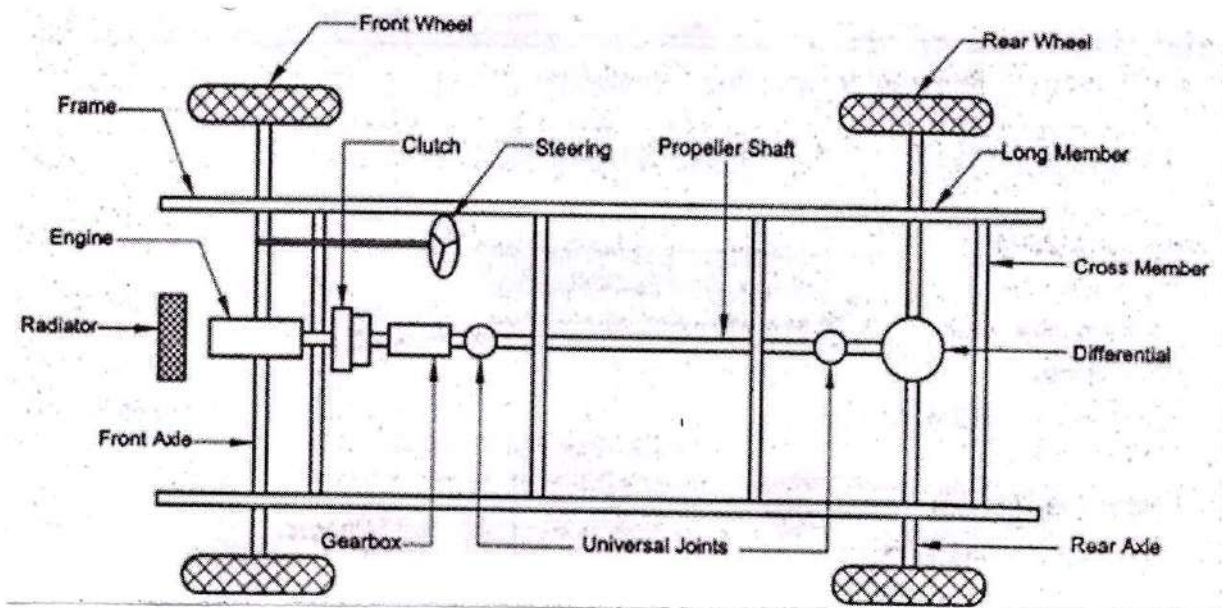
Chapter 1 : Introduction to Automobile.

1.1 Automobile : Definition, Major components of Automobiles with their functions.

* Automobile :

An automobile is a self-propelled vehicle used to carry passengers or goods from one place to another using an engine or motor.

* Major Components & Functions :-



1. Engine - Produces power by burning fuel
2. Transmission system - Transfers power from engine to wheels.
3. Chassis - Main frame that supports all parts,
4. Body - Covers vehicle & carries passengers,
5. Steering system - Controls direction of vehicle.
6. Braking system - Stops or slowdown vehicle,
7. Suspension system - Absorbs shock & gives comfort

8. Electrical system - Provides power to lights, horn, starter.
9. Fuel system - Supplies fuel to engine.
10. Exhaust system - Removes waste gases.

1.2 Classification of automobile on the basis of Purpose, Load capacity, fuel used, based on drive, no of wheels & axle, transmission, suspension.

* Classification of Automobile :

1. Based on Purpose -
 - Passenger vehicles - cars, buses (Carry people)
 - Goods vehicles → Truck, lorries (Carry materials)
 - Special purpose vehicle → Ambulance, fire engine.
2. Based on Load Capacity -
 - Light motor vehicle (LMV) - cars, jeeps.
 - Medium motor vehicle (MMV) - medium trucks.
 - Heavy motor vehicle (HMV) - Heavy trucks, trailers.
3. Based on Fuel Used -
 - Petrol vehicles
 - Diesel vehicles
 - Electric Vehicles (EV)
 - CNG / LPG vehicles.
4. Based on Drive -
 - Front wheel Drive (FWD)
 - Rear wheel Drive (RWD)
 - All wheel Drive / Four wheel Drive (4WD)
5. Based on No. of wheels & Axles -
 - 2-wheeler - Bike, scooter
 - 3-wheeler - Rickshaw
 - 4-wheeler - Car, jeep
 - Multi-axle vehicles - Trucks, trailers.

6. Based on Transmission -

- Manual transmission
- Automatic transmission
- Semi-Automatic transmission

7. Based on Suspension -

- Dependent suspension → Both wheels connected
- Independent suspension → Wheels move separately
- Air suspension → Uses air springs.

8. Based on Engine fitting -

- Front engine
- Rear engine
- Transverse under floor engine.

1.3 Vehicle Layout : Significance of vehicle layout, Different types of vehicle layout, front engine front wheel drive, front engine rear wheel drive, rear engine rear wheel drive. Four wheel drive (FEEWD, FERWD, RERWD, 4WD) Advantages & Disadvantages.

A) ~~From~~

* Vehicle Layout :

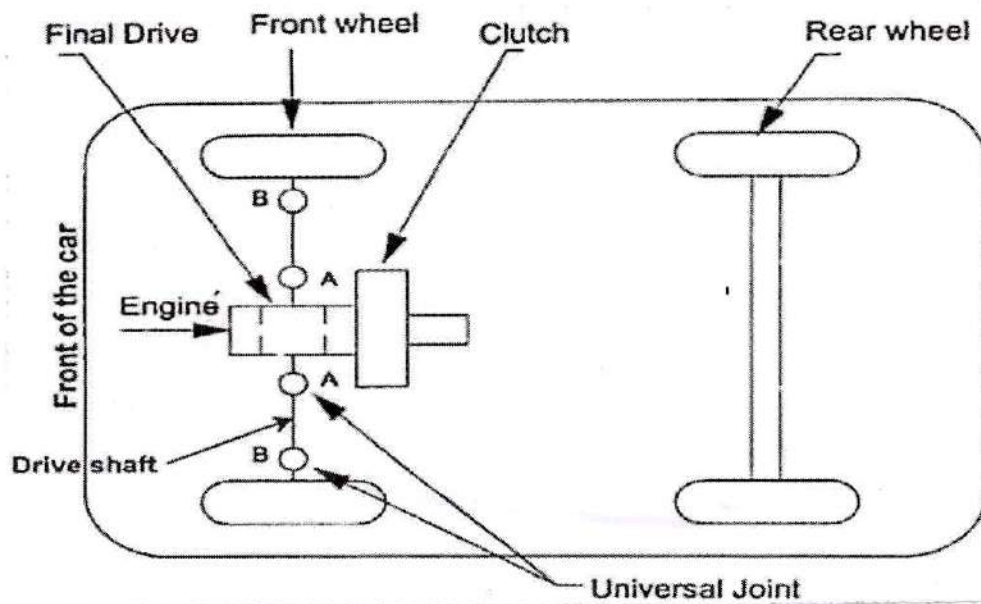
It refers to the position of engine, transmission, system & driving wheels in a vehicle.

* Types of Vehicle Layout :

1. Front Engine front wheel Drive (FEEWD) :

Description -

- Engine, clutch, gearbox are placed at the front
- Power is transmitted directly to the front wheels through a transaxle.
- No propeller shaft is reqd.
- Engine → Clutch → Gearbox → Differential → Front wheels.



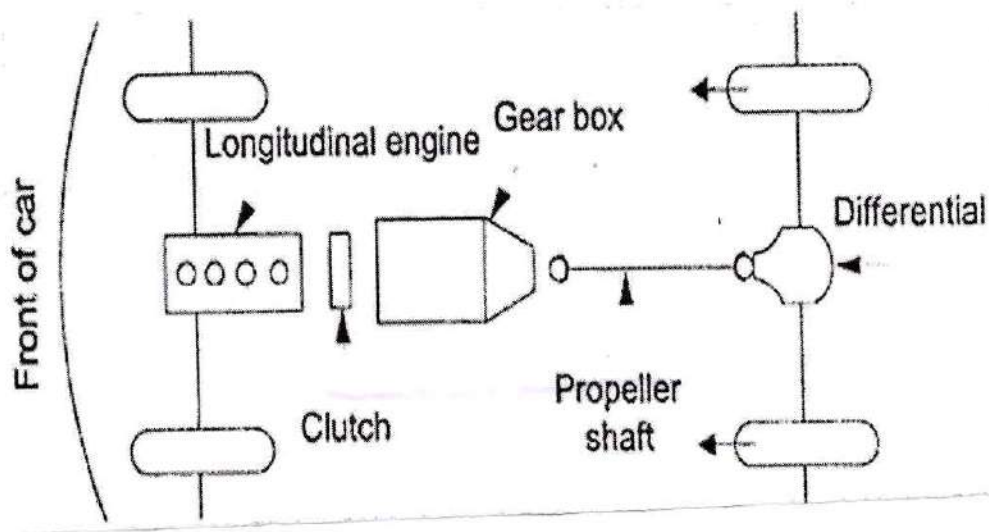
Advantages -

- Less weight - better fuel economy.
- More cabin space (no transmission tunnel)
- Good traction on wet / icy roads.
- Simple & compact design.

Disadvantages -

- Front tyres wear faster.
- Limited for high power vehicles.
- Steering becomes heavier during accelⁿ.

2. Front Engine Rear Wheel Drive (FERWD):



Description -

- Engine is at front, but power is transmitted to rear wheels.

- includes propeller shaft & rear differential,
- Engine → Clutch → gearbox → Propeller shaft → Differential → Rear wheels.
- Front wheel handle steering, rear wheels handle driving.

Application- Trucks, buses, SUV's

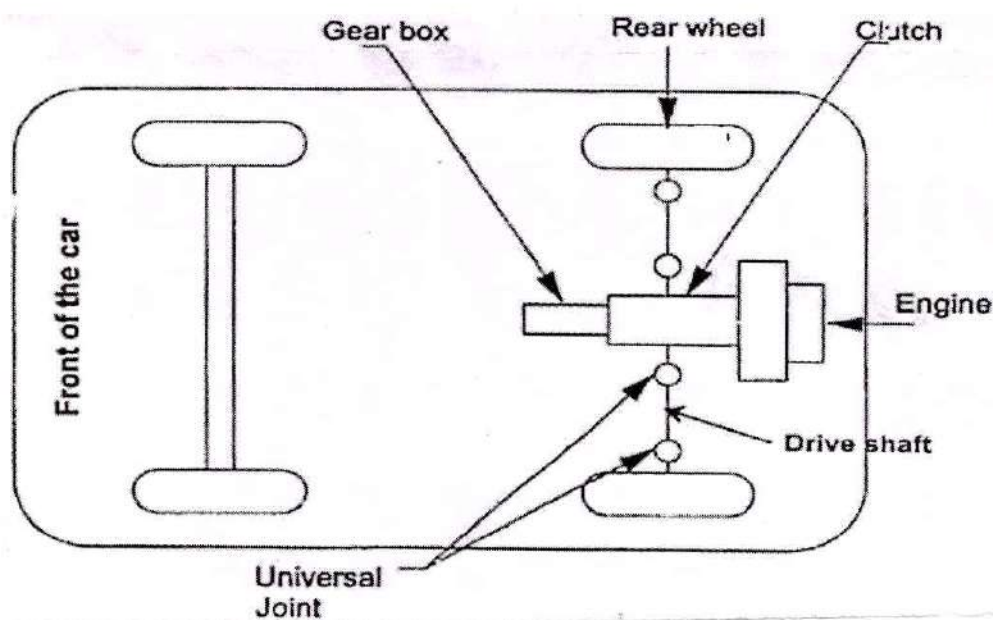
Advantages -

- Better weight distribution
- Handles heavy loads & high power.
- Improved accelⁿ
- Less load on front tyres.

Disadvantages -

- More Components - higher cost & weight.
- Power loss in long transmission,
- Less traction on slippery roads.

3. Rear Engine Rear Wheel Drive (RERWD):



Description -

- Engine is mounted at rear, near the rear axle.
- Power is directly supplied to rear wheels.

- Engine → clutch → Gear box → Differential → Rear wheels.
- No long propeller shaft needed.

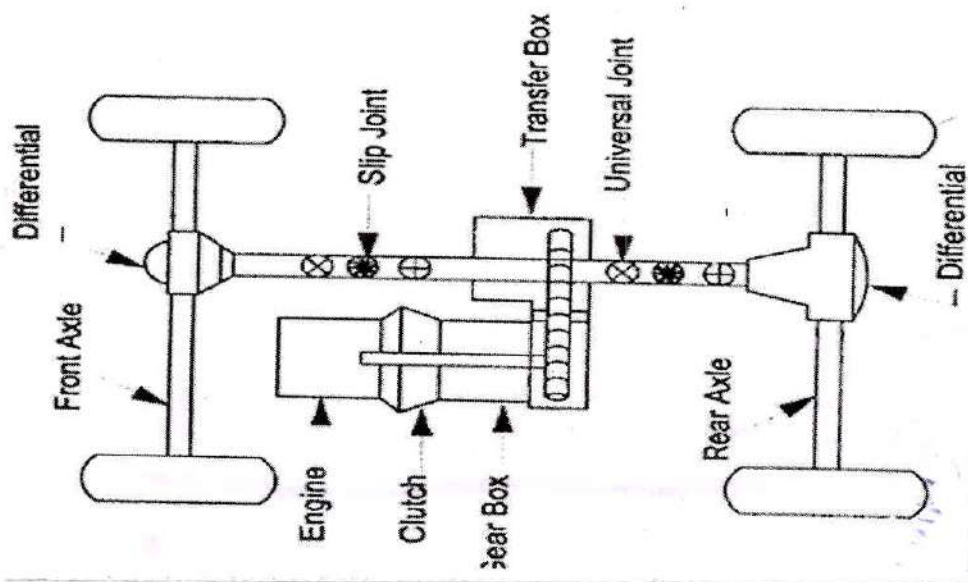
Advantages -

- Excellent traction on slopes
- Compact transmission system.
- Less transmission loss.

Disadvantages -

- cooling problem (less airflow at rear)
- Vehicle may become unstable at high speed.
- Difficult maintenance & handling.

4. Four Wheel Drive (4WD / AWD) :



Description -

- Power is supplied to all four wheels.
- Uses transfer case to divide power betⁿ front & rear axles.
- Engine → Gearbox → Transfer case → Front & Rear differentials → Wheels.

Advantages -

- Maximum traction & grip

- Best for rough roads, mud, snow.
- Improved vehicle stability & control.

Disadvantages -

- High initial cost.
- More weight & complexity.
- Higher fuel consumption.

1.4 Function of Chassis, Frame & Body : Chassis components, Functions of frame, Loads acting on frame, Advantages, disadvantages & types of frames (Conventional frame, Sub-frames, unitized frame or frameless construction), Requirements of Body, different types of body styles.

* Chassis :

Definition -

It is the complete supporting structure of an automobile on which all systems like engine, transmission, suspension & body are mounted.

Functions of Chassis -

- Supports all vehicle components.
- Provides strength & rigidity.
- Maintains proper alignment of parts.
- Withstands loads during motion.
- Ensures safety & stability.

Main components of Chassis -

- | | |
|-----------------------|-------------------|
| ◦ frame | ◦ steering system |
| ◦ Engine | ◦ Braking system |
| ◦ Transmission system | ◦ wheels & tyres. |
| ◦ Suspension system | |

* Frame :

Function of frame -

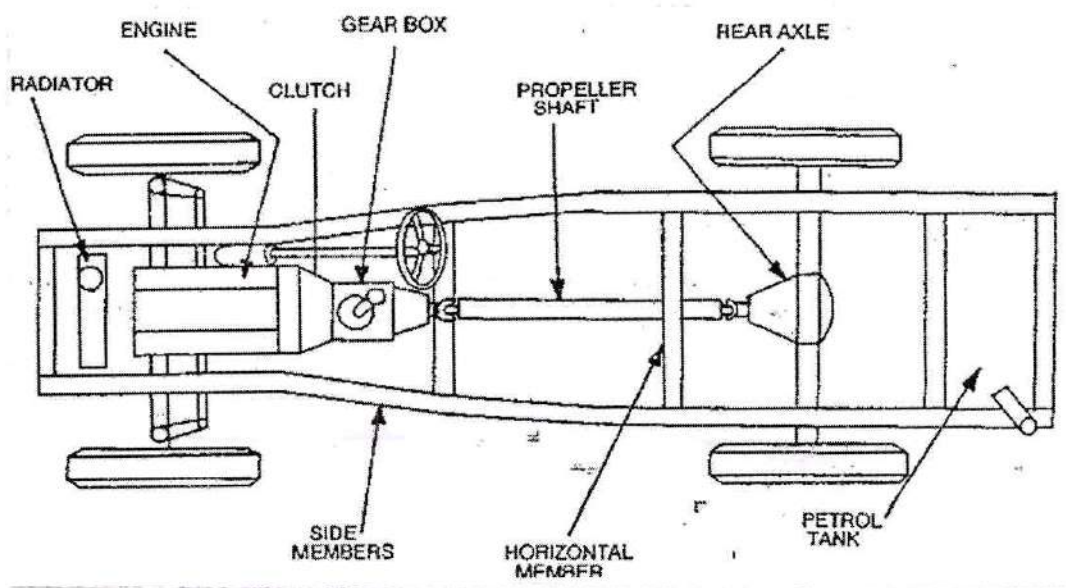
- Acts as the main skeleton of the vehicle.
- Carries engine, body & all systems.
- Provides structural strength
- Absorbs shock & vibrations.
- Maintain shape & alignment.

Loads acting on frame -

- Static load - weight of vehicle components.
- Dynamic load - Due to motion & road conditions.
- Bending load - Due to uneven road surface.
- Torsional load - Twisting during turning.
- Impact load - Sudden shocks (potholes, braking)

* Types of frames :

1. Conventional frame (Ladder frame) -



Construction -

- Consist of two long parallel side members (steel beams)
- connected by cross members (like a ladder)
- Components mounted on top of this frame

Working -

- carries all loads separately from the body.

◦ Body is mounted over frame using Bolts.

Advantages -

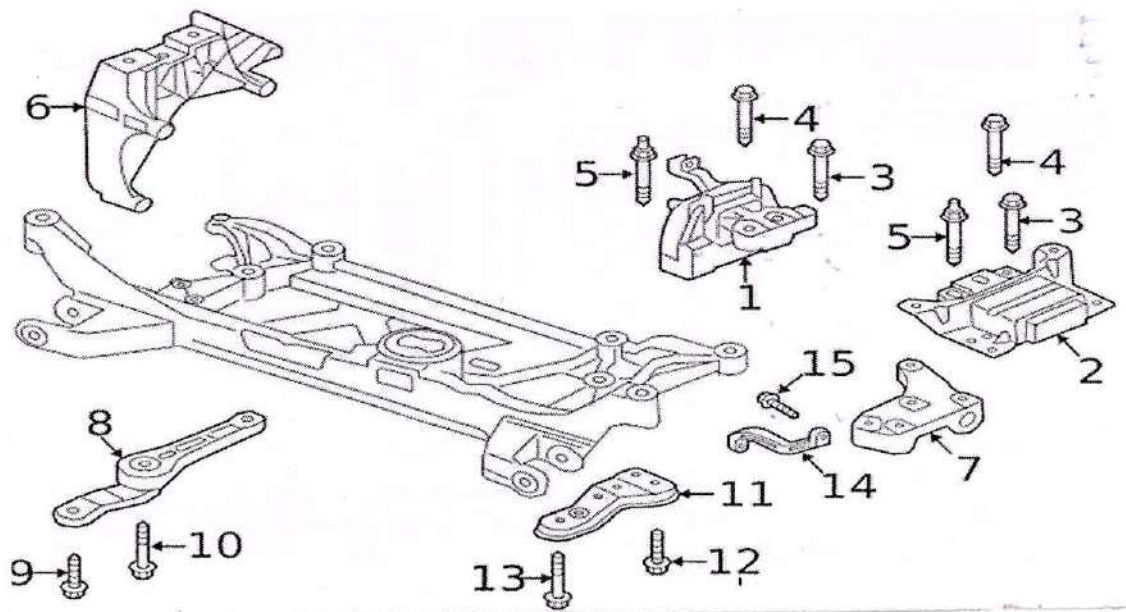
- Very strong & rigid.
- Suitable for heavy loads & rough use.
- Easy to repair & modify.
- Good for off-road vehicles.

Disadvantages -

- Heavy weight → Reduces fuel efficiency.
- More material reqd
- Less ride comfort

Applⁿ - Trucks, jeeps, buses, commercial vehicles.

2. Sub-frame -



Construction -

- A small auxiliary frame attached to main body or Chassis.
- Supports specific parts like engine, gearbox, suspen.

Working -

- Isolates vibrations using rubber mountings.
- Acts as a support unit instead of full frame.

Advantages -

- Reduces noise, vibration, harshness (NVH)
- Simplifies assembly & maintenance.

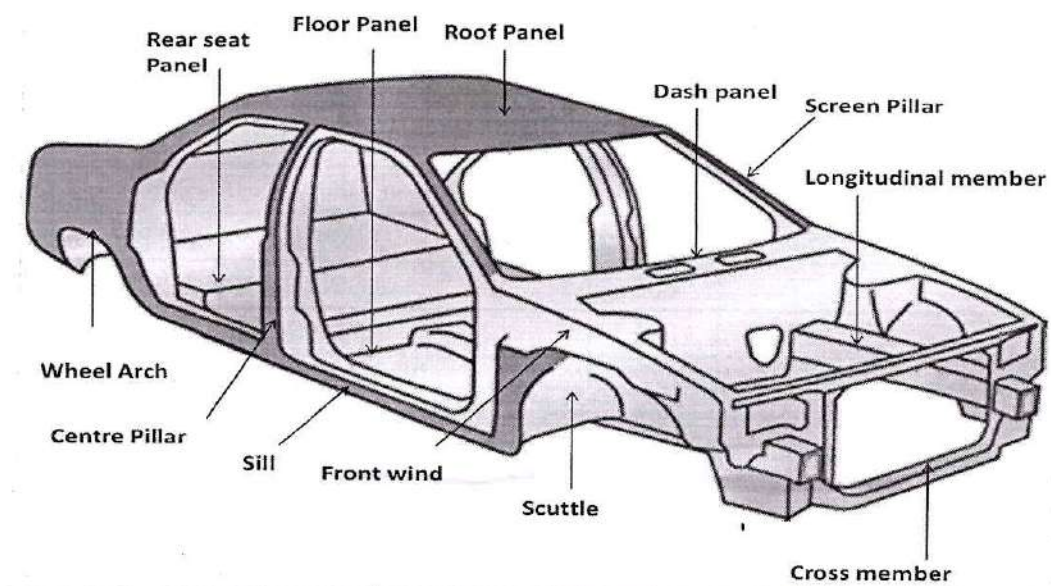
- Protects main structure from stress.

Disadvantages -

- Adds extra cost & complexity.
- Cannot carry full vehicle load independently.

Applⁿ - modern cars.

3. Unitized frame (Monocoque / frameless constr.):



Construction -

- Frame & body are combined into a single unit.
- Uses sheet metal panels welded together.
- Load is distributed over the entire body.

Working -

- No separate frame.
- Entire structure act as a load-carrying shell.

Advantages -

- Lightweight - better fuel efficiency.
- Improved safety (crumple zones)
- Less material reqd
- Better ride comfort & stability.

Disadvantages -

- Difficult & costly repair after accident.
- Not suitable for heavy-duty applⁿ
- Requires advanced manufacturing.

Applⁿ - most modern cars (sedans, hatchbacks).

4. Semi-Integral frame (Semi-Monocoque) ← Extra,

* Body of Automobile:

◦ Requirements of good body:

- Should be light & in weight.
- Must have high strength
- Provide comfort & safety.
- Good aerodynamic shape.
- Protection from weather
- Attractive appearance.

◦ Functions of Body:

- Provides space for passengers / goods.
- Protects from external conditions.
- Improves vehicle appearance
- Enhances comfort.

* Types of Body Styles:



Sedan



Hatchback



Coupe



SUV



Sportscars



Convertible



Crossover



Muscle Car



Station Wagon



Pickup Truck



Jeep



Limousine

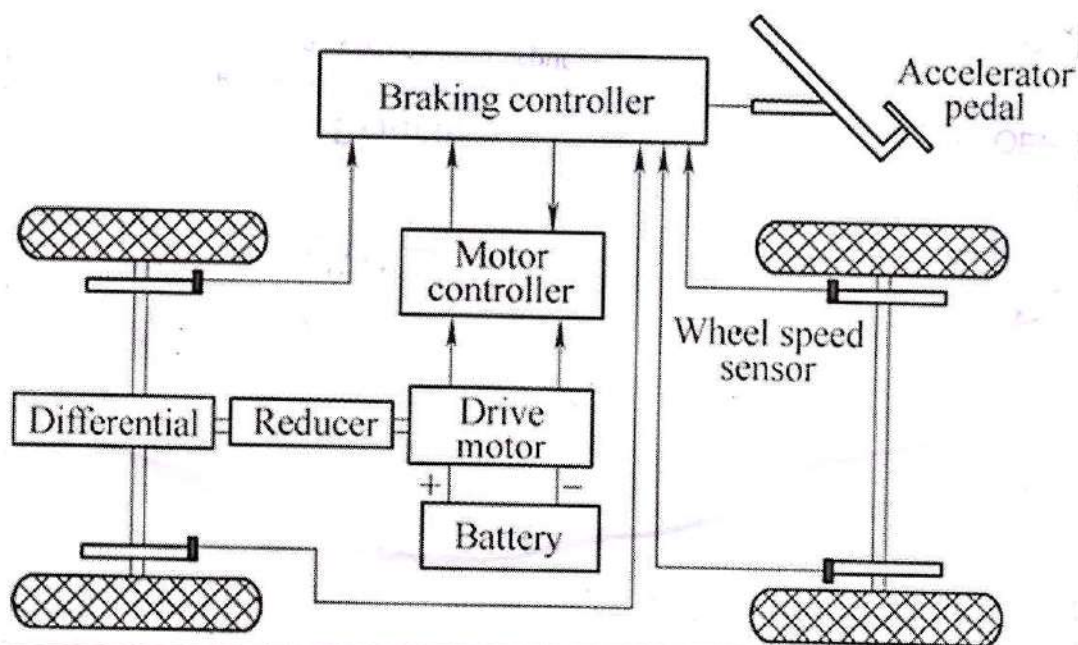
- Sedan - 4 doors, separate boot.
- Hatchback - Rear door open upward
- SUV (Sport Utility Vehicle) - High Ground Clearance
- Coupe → 2-door sporty car
- Convertible - Open roof
- Van / Minibus - Passenger transport
- Pickup Truck - Goods + Passenger.

1.5 Electric & Hybrid Vehicle : Need, components & their functions.

* Need of Electric & Hybrid Vehicles :

- Reduction in pollution (less CO_2 , NO_x emissions)
- Saving fossile fuels (petrol, diesel are limited)
- Better fuel economy.
- Lower running cost.
- Govt. regulations for clean energy.
- Energy security (use of electricity / renewables).

* Electric Vehicle (EV) :



Defⁿ - It is a vehicle that runs only on electric power using a battery & electric motor instead of ICE engine.

Main components & functions -

1. Battery Pack - stores & supply electric energy.
2. Electric motor - Drives the wheel
3. Controller (Inverter) - controls speed & torque.
4. Charger - charges battery from external power.
5. DC-DC converter - Converts high voltage to low voltage (for lights, horn).
6. Transmission (Single-speed) - Transfer power from motor to wheels.

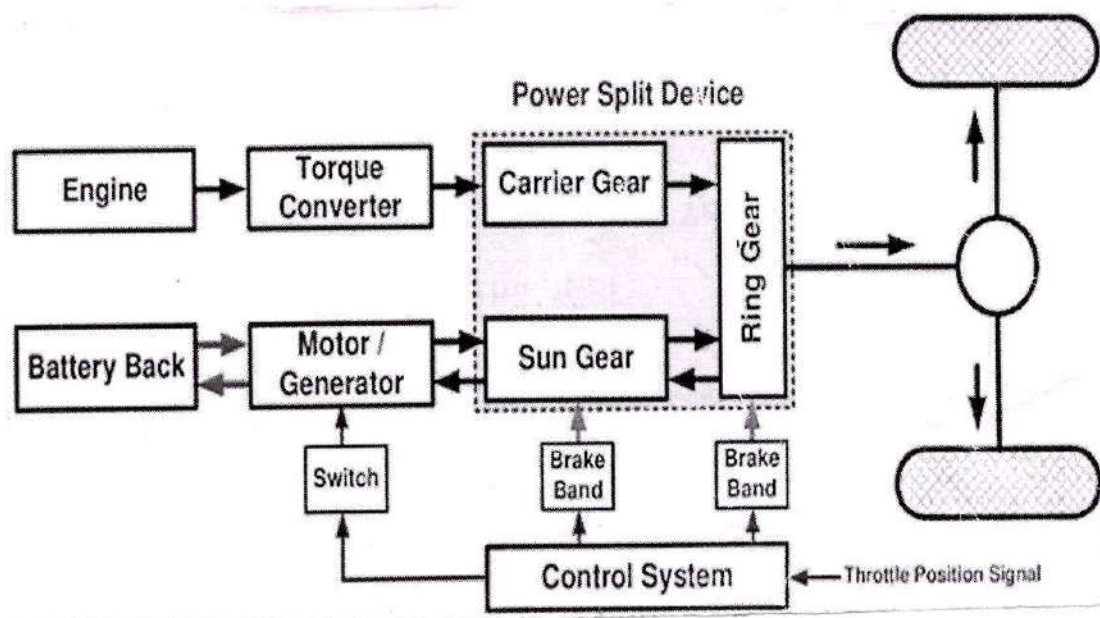
Advantages of EV -

- Zero tailpipe emission
- Low running cost
- Less maintenance
- Smooth & silent operation.

Disadvantages of EV -

- High initial cost
- Limited driving range
- Charging time reqd
- Charging infrastructure still developing.

* Hybrid Vehicles :



Defⁿ - A hybrid vehicle uses both an IC engine & an electric motor for propulsion.

Main Components & Functions -

1. IC Engine - Provides power using fuel.
2. Electric motor - Assists engine or drive vehicle alone
3. Battery - stores electrical energy for motor.
4. Generator - Converts mechanical to electrical energy.
5. Power control unit - Controls power flow betⁿ engine & motor.

Types of hybrid vehicles -

- Series hybrid - Engine generates electricity only.
- Parallel hybrid - Engine & motor both drive wheels.
- Series-Parallel hybrid - Combination of both

Advantages of HV:

- Better fuel efficiency than conventional vehicles.
- Reduced emissions.
- Longer range than EVs.
- Regenerative braking (energy recovery)

Disadvantages of HV:

- More complex system.
- Higher cost than normal vehicles.
- Maintenance is more complicated.

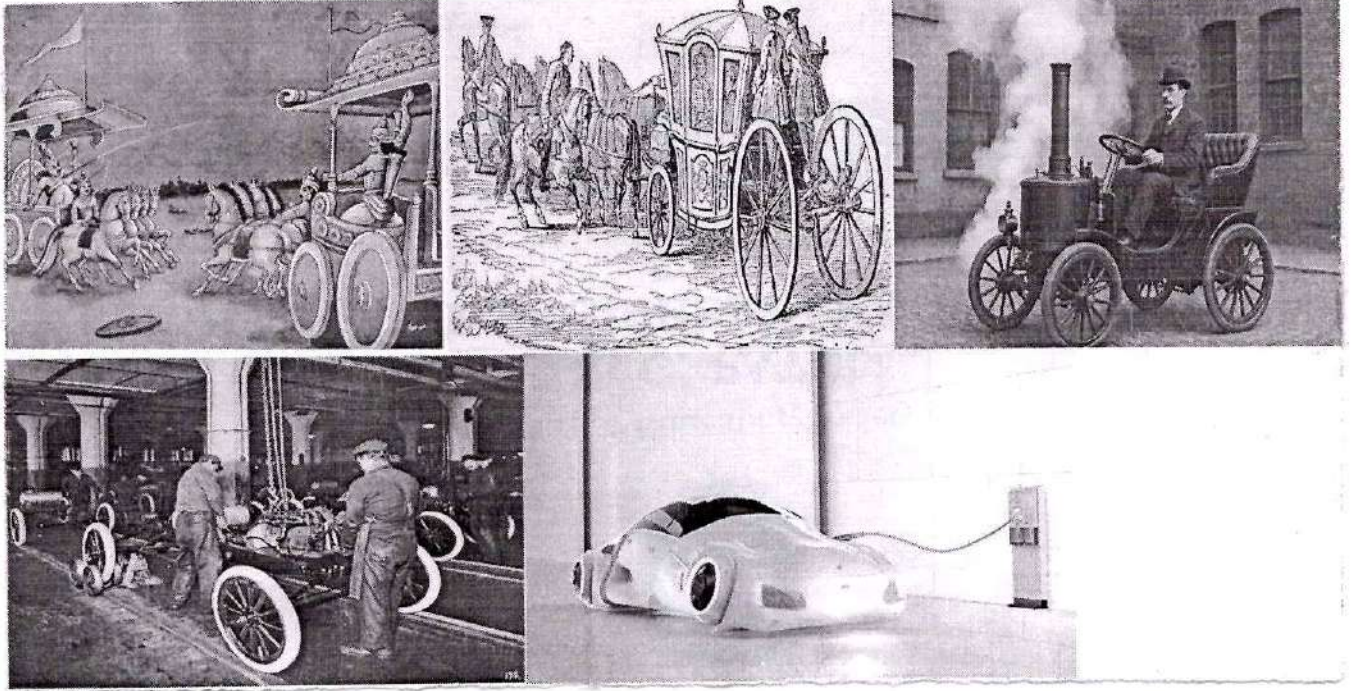
1.6 Development of Automobiles from Ancient Times (IKS)

1. Ancient Period (Indian knowledge system - IKS)
 - Early transport used human & animal power.

• e.g. Bullock carts, horse chariots (Rath)

2. Medieval period -

- Use of animal driven vehicles ~~continued~~ continued.
- Improved carriages & carts.
- Used for kings, trade & transport.



3. Early modern period (18th - 19th Century) -

- Development of steam-powered vehicles.
- First practical automobile by Karl Benz (1885)
- Beginning of self propelled vehicles.

4. Modern Automobiles (20th Century) -

- Use of petrol & diesel engines.
- Mass production started (e.g. Ford Model T)
- Improved speed, comfort & safety.

5. Present & future Automobiles -

- Development of EVs & HVs
- Focus on eco-friendly & smart vehicles.
- Introduction of autonomous (self-driving) cars.

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