



Assignment - 1

Q1 Explain the journey of Automotive with the help flowchart from the Beginning of 18th Century to the 21st Century and give brief description on the following milestones in the Automotive journey.

(a) Invention of electric motor.

(b) Golden Era of EV:-

In 1906 Electrical vehicle are more popular than other vehicles.

There range is 10-11 km in Single Charge
Top speed for this vehicle around 45-50 kmph

Main advantage of EV's popular in 1906

(a) Quick start than the other vehicles
a Steam engine and gasoline engine
time of starting is more

(c) starting time.

Steam engine = Around 45 min.

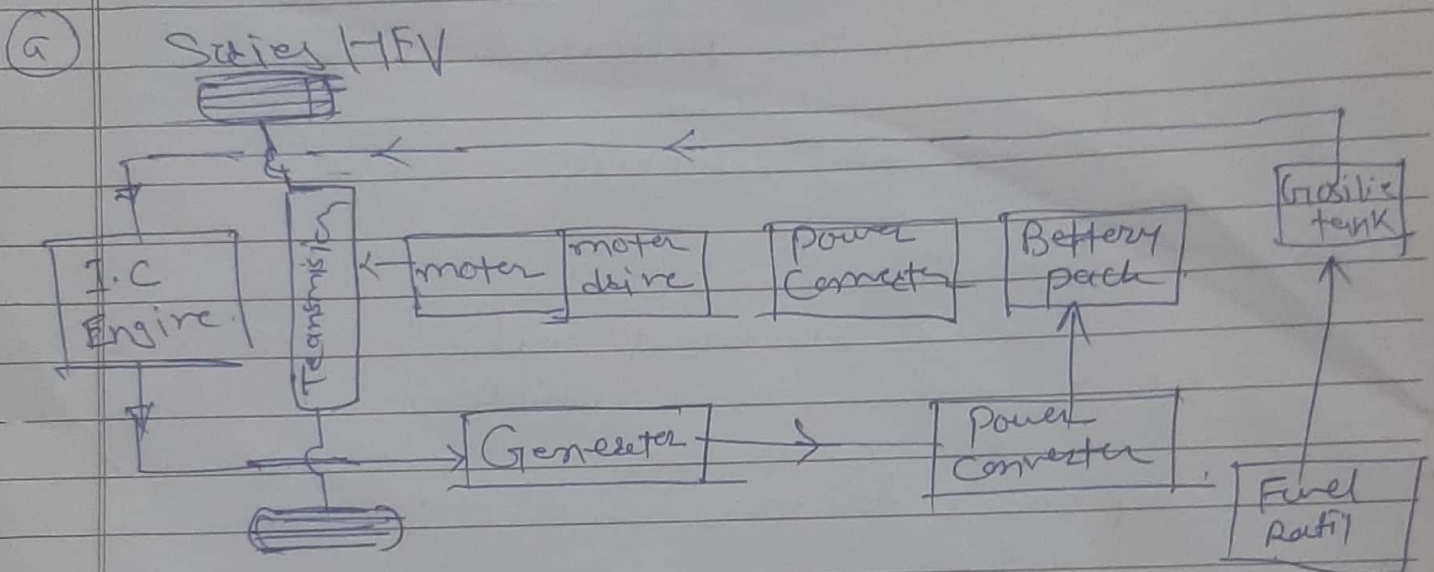
- Gasoline engine = Around 15-20 min

EVs = Quick start.

- In [1894-1910] in this period has mention to the golden Era of electric vehicle.



Q2. Explain and draw the layout of following hybrid electrical vehicle with their two advantages and disadvantages and industrial applⁿ in automotive segment.



Advantages of Series HEV

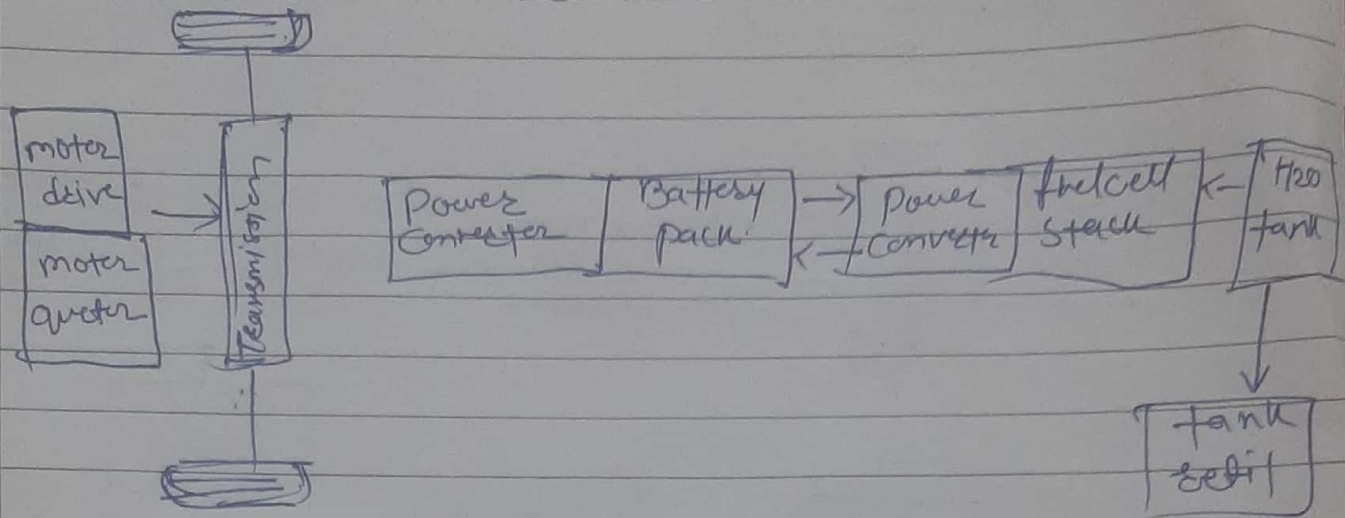
- ① The engine operates at its maximum efficiency
- ② When fuel is empty, Battery can run the vehicle.

* Disadvantages

- ① Transmission efficiency is low.
- ② Weight of this vehicle is heavy



Fuel Cell electric vehicle



Advantages.

High energy density improves productivities

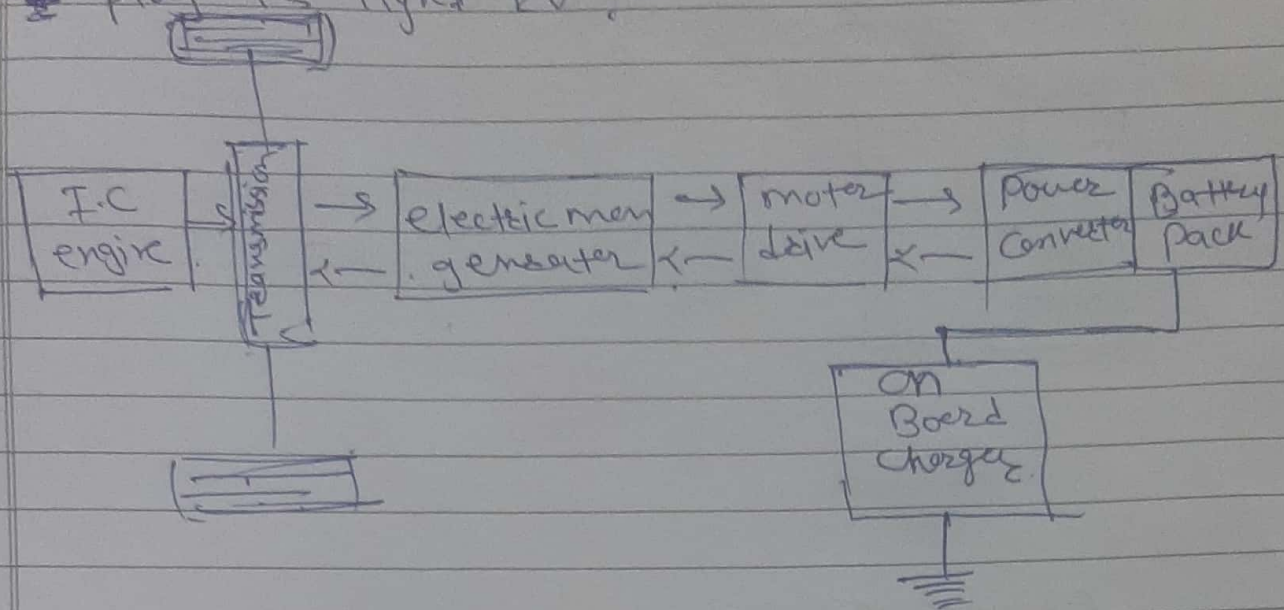
It's not Harmful compared to Li⁺ Battery.

Disadvantages.

- ① Hydrogen Storage and transportation.
- ② Fuel Cell efficiency less.



* plug in Hynd EV :-



* Advantages of plug in HEV

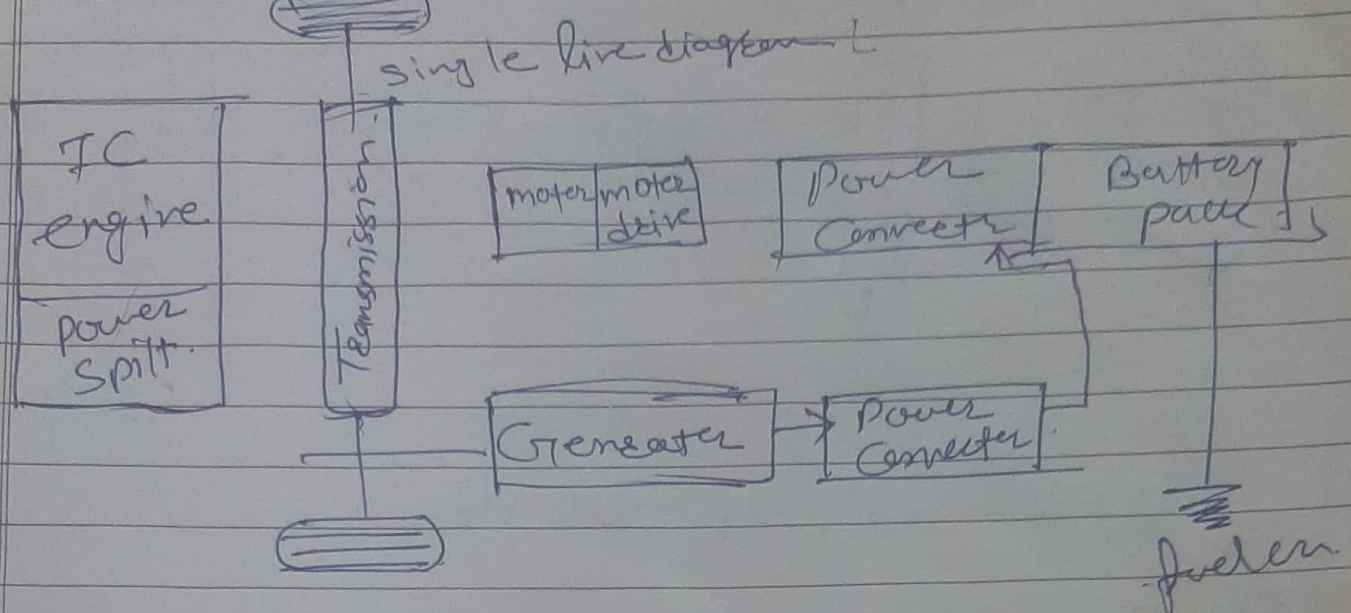
- ① They can give separate transmission power for I.C engine and hence give more power
- ② Easy to drive

Disadvantages,

- ① weight of vehicle more
- ② complex to maintain,
- ③ costly



Series parallel HEV



Advantage of series and parallel HEV

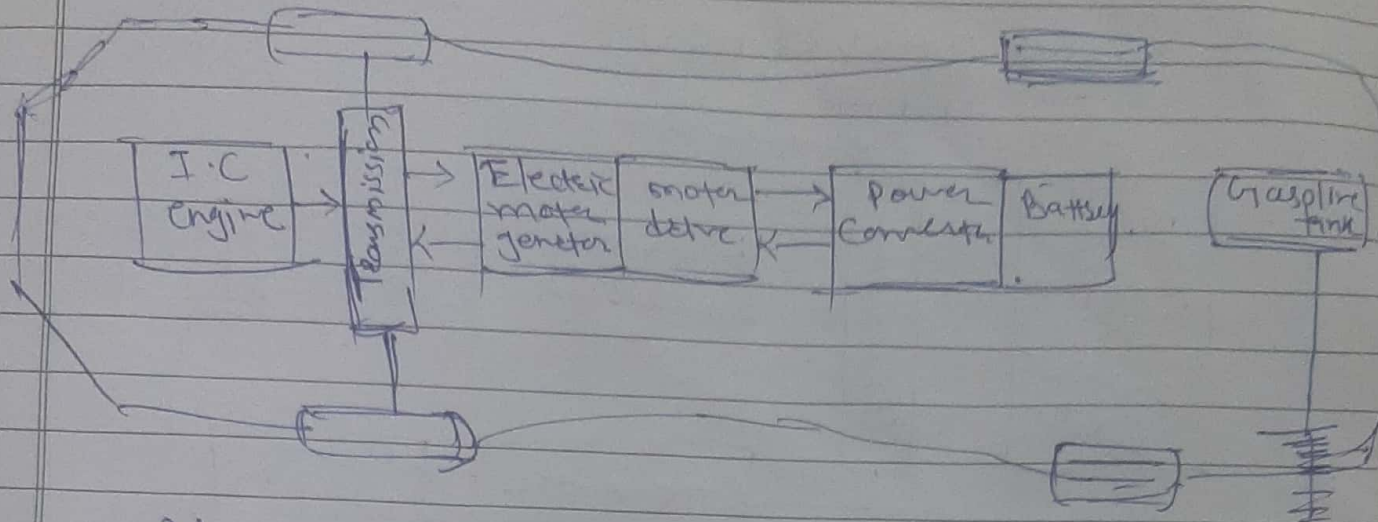
- ① Give the more range
- ② we can drive without gasoline.

Disadvantage of series and parallel HEV
weight of this car is more

Efficiency is less compared to IC engine.



⑤ Parallel HEV.



Advantage of parallel HEV :

- ① Transmission efficiency is high as compared Series HEV
- ② vehicle transmission can charge the battery

Disadvantage of HEV :

High voltage system repair can be more expensive.

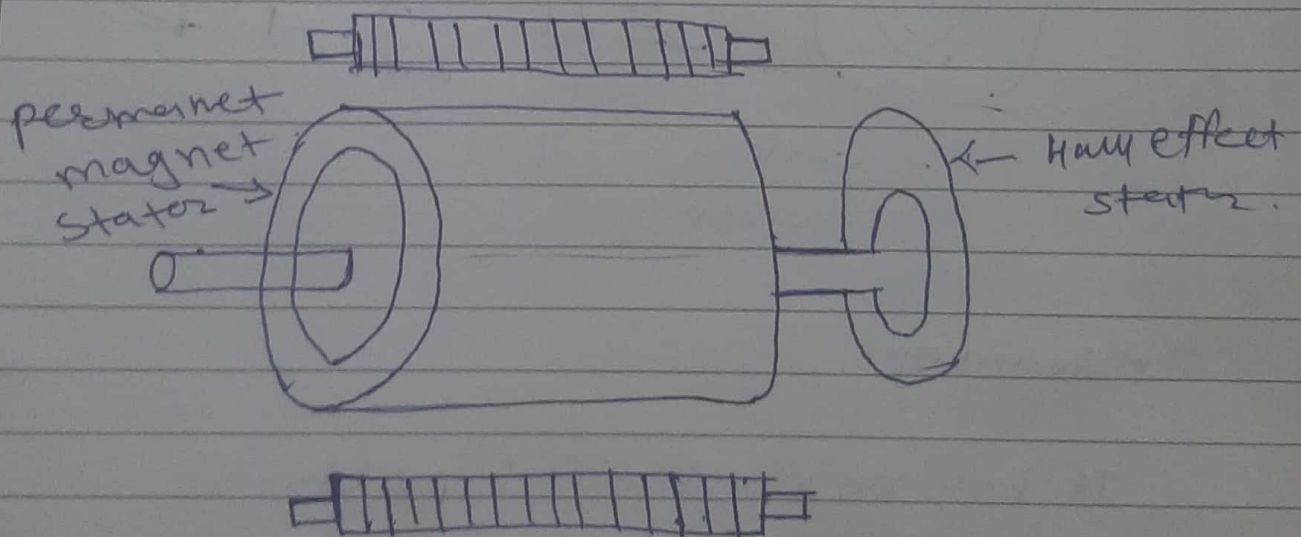
They have a low power provided in battery mode



Q3 Explain with diagram Construction and working principle of Brushless motor BLDC?

→

Construction: BLDC motor have many similarities to AC inducting motor and Brushed DC motor in terms of construction and working principle respectively. BLDC motor also have stator and rotor motor constructed in different physical configuration. Depending on the stator windings. These are configured as single phase two-phase and Three-phase. However 3-ph ~~BLDC~~ BLDC with permanent magnet rotor are most commonly used.

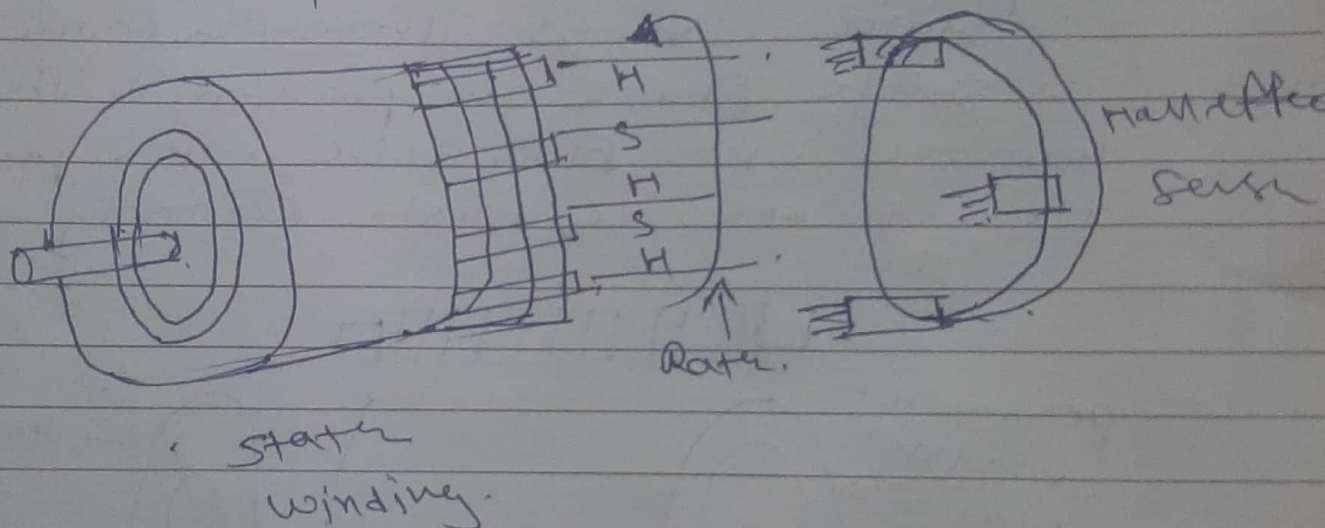


BLDC motor



working principle of BLDC motor

BLDC motor work on the principle similar of that of a conventional DC motor i.e. the Lorentz's Force law which states that whenever a current carrying conductor placed in magnetic field. As a consequence of reaction force the conductor will experience an equal and opposite force in case of BLDC motor, the current carrying conductor is stationary while the permanent magnet rotates.



Advantages

It has no mechanical problems,
High efficiency due to use of permanent
less electromagnetic interference.

Disadvantage,

These motor are costly
It needs additional sensors,



Applⁿ

Pumps, beloms and fans.

Electric vehicles.

Computer hard drives.

Q4th

Explain Battery pack composition with initial components description as well as advantages and Disadvantage of Battery pack in E-V installation.

①

Traction Battery pack:- Function of a battery in EV is storage of the electrical energy in the form of DC current. If it gets single form of controller, the battery will flow DC electric energy to the inverter then used to drive the motor. The battery is rechargeable which is arranged in such a way as to form is called a traction battery pack.

Power Inverter:- In inverter function its function is to change the DC current in the battery pack into an AC current and then the AC current used by EV.



contactors : contactors are electrically actuated switches that are primarily used to disconnect the battery pack from the vehicle's high voltage system when the vehicle is not in use. However, contactors are also a safety item that can be opened to disconnect the battery pack if some part of the vehicle malfunctions and is forcing the battery pack outside its design envelope.

Pre-charge circuit : As a battery pack closes the contactors and transitions from a disconnected state to a connected state to a connected state, there is a possibility for momentarily but very large current. Thus, the transition must be a controlled process. That control is provided by the precharge circuit. The precharge circuit consists of an additional contactor. ~~under~~

Fuse : The fuse is another important safety device. The fuse is used to protect components from excess current, including current above the contactor interrupt rating. Fuse selection is not trivial and must be coordinate with the other high voltage system components such that all necessary failure modes are covered by either the fuse or the contactors.



manual service disconnect (MSD)

A fourth safety device used within a high voltage battery pack is called a manual service disconnect (MSD). This device is a method for breaking the electrical continuity within the pack for the purpose of vehicle service. The MSD is often a touch safe, removable enclosure containing the fuse. Removal of the MSD is useful for servicing the high voltage system of the vehicle because the positive and negative connections to the pack are no longer electrically connected.

HVIL :- one lined safety mechanism used to some high voltage pack in the HVIL.

Advantages

1. Improves efficiency
2. vehicle runs smoothly
3. Environmental friendly

Disadvantage

1. Cost of battery pack is very high
2. Recharge time is high
3. Heating problem in electric vehicle.