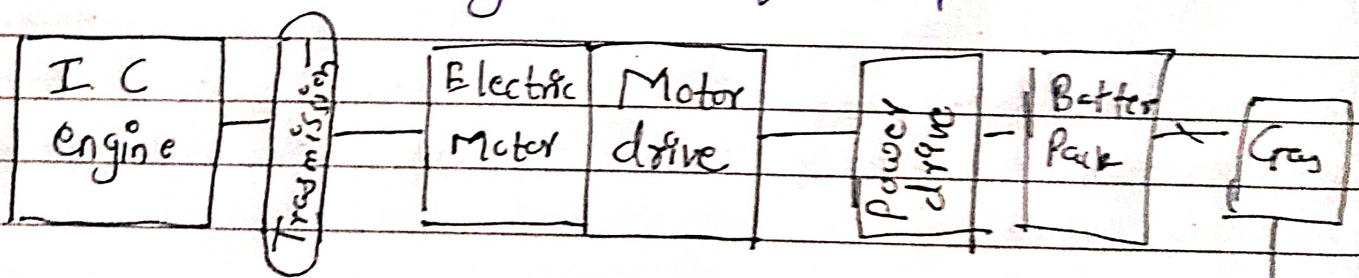


Assignment No 1

- 1) Explain and draw Layout of following Hybrid Electric vehicles with their two Advantages, Disadvantage & Industrial application in automotive
- a) Series Hybrid b) Parallel hybrid c) Series Parallel Hybrid
d) Plug in Hybrid e) Fuel cell vehicle

- a) Parallel Hybrid: In this case the IC engine is the primary source of energy. The electric motor is playing a secondary role. We can have a lot of options in the case of parallel hybrid vehicle. There are following 4 cases:
- Case I: IC engine drives the vehicle: In this case we use the IC engine as the primary source and the motor is not used
 - Case II: Motor is Primary Drive: In this case we use the motor as primary and the engine is not used
 - Case III: Hybrid Mode: In this case we use the same motor and engine in equal proportion



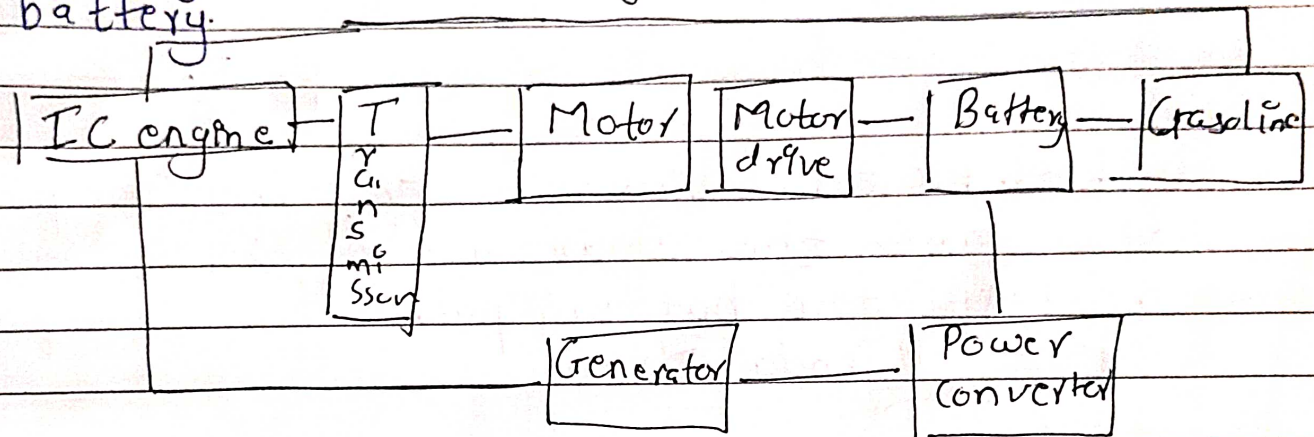
Hybrid Vehicle Architecture

Advantages: They can also be more fuel-efficient than traditional gasoline-powered vehicles and emit less greenhouse gas

Disadvantage: However, parallel hybrid can be more expensive than traditional vehicles and they may require more maintenance due to the added complexity of the hybrid powertrain.

b) Series Hybrid Mode:

Series Hybrid Mode: In series combination the motor is the primary source of drive and the IC engine is used as generator to charge the battery.



Vehicle architecture of Series HEV

The example of series hybrid is Chevrolet Volt.

* Advantages:

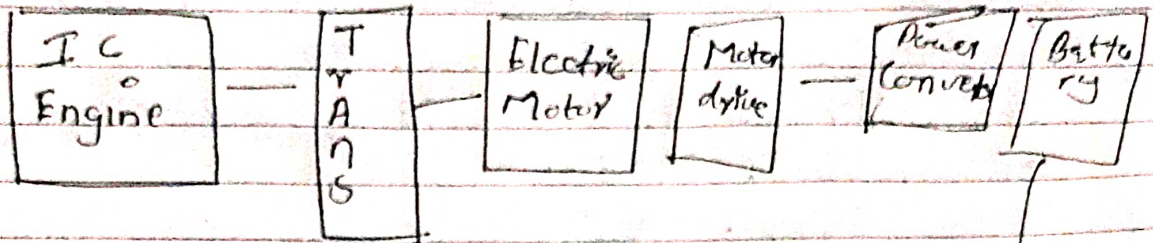
They primarily work on motor hence are more fuel efficient and is quite in performance.

* Disadvantages:

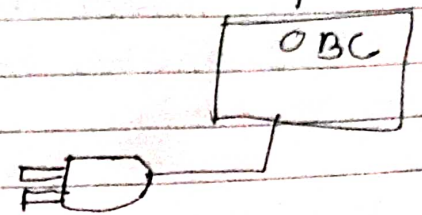
However series hybrid can be more expensive than parallel hybrid and they may have not offer same level of performance.

c) Plug-In Hybrid Vehicle: In plug in hybrid are similar to plug-in vehicle parallel hybrid, but with the added ability to plug into electric outlet to recharge the battery. This means it can run on electric power alone.

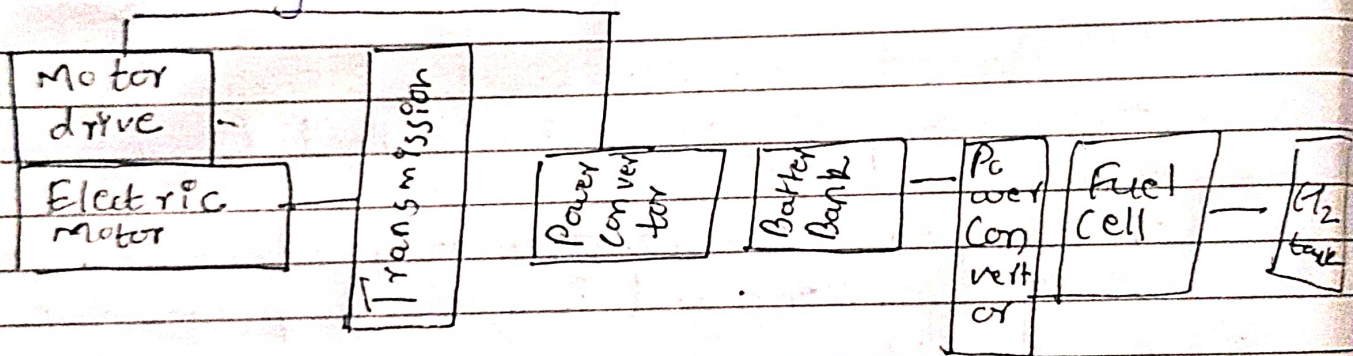
Fuel Cell Electric Vehicle



Architecture Plug-In Hybrid.



Fuel Cell Electric Vehicle. In this the concept remains the same the hydrogen fuel cell is used to recharge the battery pack. The example of it is Hyundai Nexo.



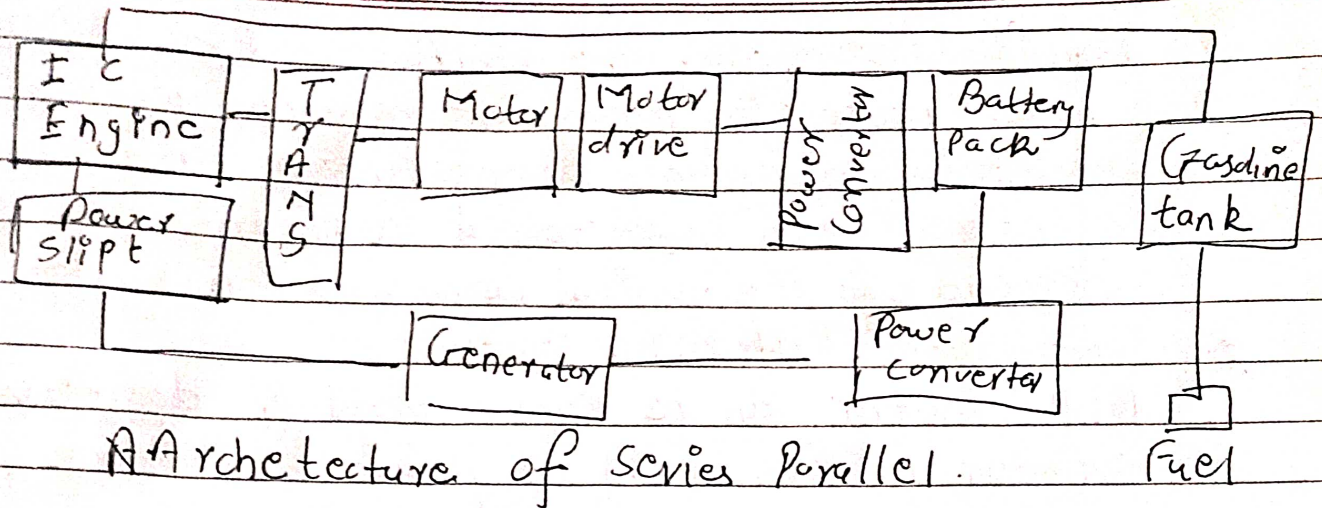
Architecture of fuel cell electric

Advantage

It gives higher performance.

Disadvantage: It gives is difficult to store hydrogen and space requirement.

Series-Parallel Combination: These type of combination the power is split into generator and motor and these system are bulky. It is used to go to places.



Architecture of Series Parallel. Fuel

- 2) Explain the journey of Automotive with help of flow chart from 18th century to 21st give brief description on the following in the automotive.
- Journey: a) Invention of Electric b) Coming New Era
c) Golden Era of EV d) Indroduction

- a) **Invention of Electric Vehicle:** In 1828 there was a scientist called Anzias Zedlick for indigenous electric motor. London underground in 1865 electric tram was introduced in Birmingham. In 1886 electric vehicle came in production. The first willmorrison carriage invented EV with motor size 4 Hp motor with battery 6.5 kWhr and 58V
- b) **Golden Era of EV:** In 1906 the electric vehicle were very advanced. EV had 32% of market. The EV have no emission and very efficient. In 1910 the due to world war there were range issue
- c) **Incoming New Era of EV:** In 2003 Carbon release band established LEV II i.e. LEV (Low Emission Vehicle) ULEV (Ultra Low emission) 70% - 80% emission and PZEV (Pure Zero emission)

3) Explain construction and working of BLDC Motor?

→ A bldc motor is permanent magnet electric motor which is driven by direct current and a complex electronically controlled commutation system instead of mechanical commutation system.

* Construction of BLDC Motor:

BLDC motor can be constructed in different configuration. They are two phase and three phase motor. However,

→ Stator of BLDC motor made up of stacked steel lamination to carry the winding. These are placed slot which are axially cut along the inner periphery of stator.

→ Each winding is constructed with numerous coil where one or more coil are placed in each slot.

* Rotor:

BLDC motor incorporate a permanent in the rotor. The number of poles in rotor can vary from 2 to 8 in order achieve maximum torque.

* Working Principle of BLDC motor: BLDC motor work on the principle of DC motor the Lorentz force law states that whenever a current carrying conductor is placed in magnetic field it experiences force. In case of BLDC current carrying conductor is stationary while magnet moves.