

ASSIGNMENT.

1. Explain the journey of automotive with the help of flow chart from the beginning of 8th century to the 21st century & give brief description of the following milestones in the automotive

1796 → origin of Steam Engine.

1806 → first ICE on fuel gas.

1837 → first successful E.V locomotive

1896 → first successful E.V

1912 → peak production of EV

1924 → }
1950 → } Domination by Gasoline car.

1960 → Concept prototype and serious design of EV

1970 → limited production of EV

1980 → Incorporate technology advance in EV design

1990 → first generation of EV

2000 → Hybridised EV to increase level of supply

2020 →

Golden
era of
E.V

Invention of Electric motor 1837 the first patent for an electric motor was granted in US. by Thomas Edison which is the power small electric vehicle which converts electrical energy to mechanical energy which powers the wheels.

Golden Era of EV.

which is marked from 1837 to 1924. with peak production of EV in the market, the range was limited by energy storage. William Morrison who invented the first fully successful EV with 6 passenger vehicle with top end of 14 miles per hour EV became popular @ that time because of less starting time, low cost, efficient.

Domination of Electric vehicle by Gasoline vehicle.

After

Because of the invention of self start mechanism and by world war II the soldiers use gasoline vehicle because of quick refill and ease and Harley Davidson bikes are famous that time because of soldiers' emotion to war bikes.

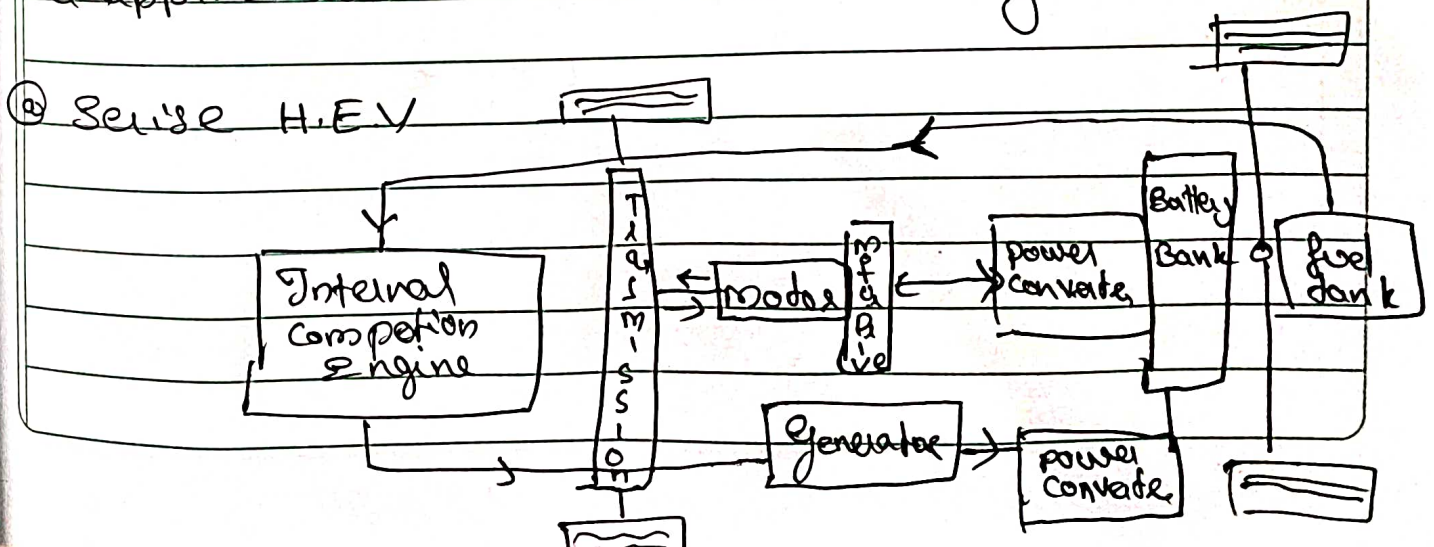
Coming of new Era of EV

Due to CARB the manufacturer to provide an EV alternation to market. In 2006 Santa Monica auto Expo Tesla presented Roadster. In 2008 launched Tesla Roadster complete EV. 2010 Nissan leaf first affordable hatchback EV. In 2011 the sales increase by 40,000 million of sales globally.

Introduction of Hybrid EV

Porsche introduced H.EV in 1901. and Toyota prius in 1997 was the widely accepted H.E.V taken by Honda insight in 1999. and now a days. H.E.V is most familer and comes with 3 types parallel HEV, series H.E.V, series parallel H.E.V and plug in H.E.V. and fuel cell EV.

Q2. Explain and draw the layout of following H.E.V with their two advantages, disadvantages & application in automotive segment.



Advantages

- * mechanical decoupling b/w the ICE & wheels allow the engine operating at narrow optimal region.
- * Nearly ideal torque-speed characteristics of E. motor make multi-gear transmission unnecessary.

Dis advantages

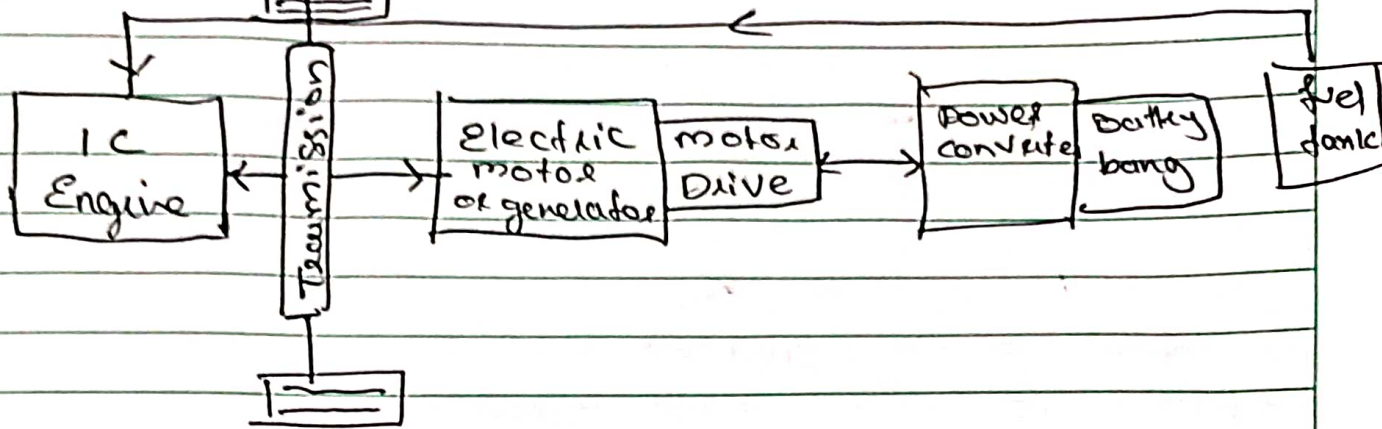
- * The Energy is converted twice, which reduces efficiency.
- * energy losses.

Parallel P.D.E.D

Advantages: application

→ used in BMW i3 hybrid.

parallel H.E.V



case 1 → has two power sources. & IC Engine is prime mover

→ IC Engine drive & motor will not work

case 2 → Electric motor drive while IC Engine is off. motor will be running.

case 3 → where IC Engine will be running & motor also working.

case 4 → when low charge mode IC Engine works and motor get charged.

Case 5 → regenerating braking.

Advantage →

Both Engine and electric motor directly supply torque to the driven wheels and no energy from conversion occurs, hence energy loss is less.

* compactness due to no need of the generator and smaller traction motor

Disadvantages

* mechanical coupling b/w the engine and the driven wheels. ~~and no energy from generator~~ ~~energy and no energy from~~ Thus the engine operating points cannot be fixed in a narrow speed region.

* The mechanical configuration and the control strategy are complex compared to series hybrid drive trains

~~Applications~~

~~Advantages~~

- ~~→ High efficiency in traffic.~~
- ~~→ Easy to control.~~

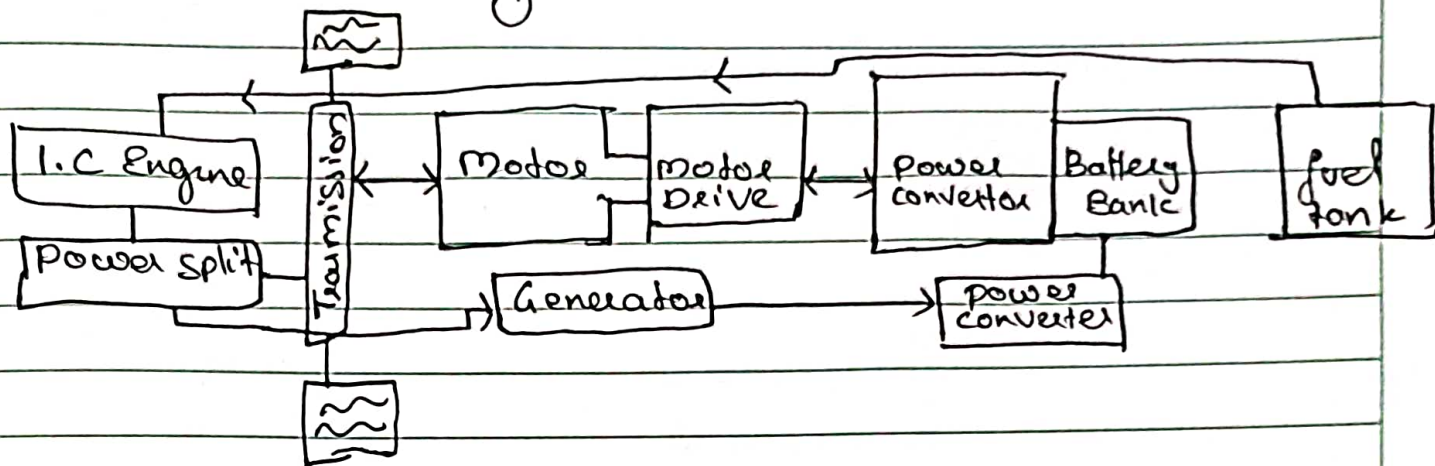
~~Disadvantages~~

- ~~→ relatively expensive & complex to maintain.~~
- ~~→ Battery life concerns.~~

Application

uses in BMW i8 series.

Series - parallel hybrid vehicle.



- * motor is directly connected to transmission.
- * IC Engine is connected to power split. The power split splits the power to transmission and generator.
- * In low power / charge battery the IC Engine can split the power to charge the battery, using generator.

Advantages.

- * High efficient
- * fuel efficient

Disadvantages.

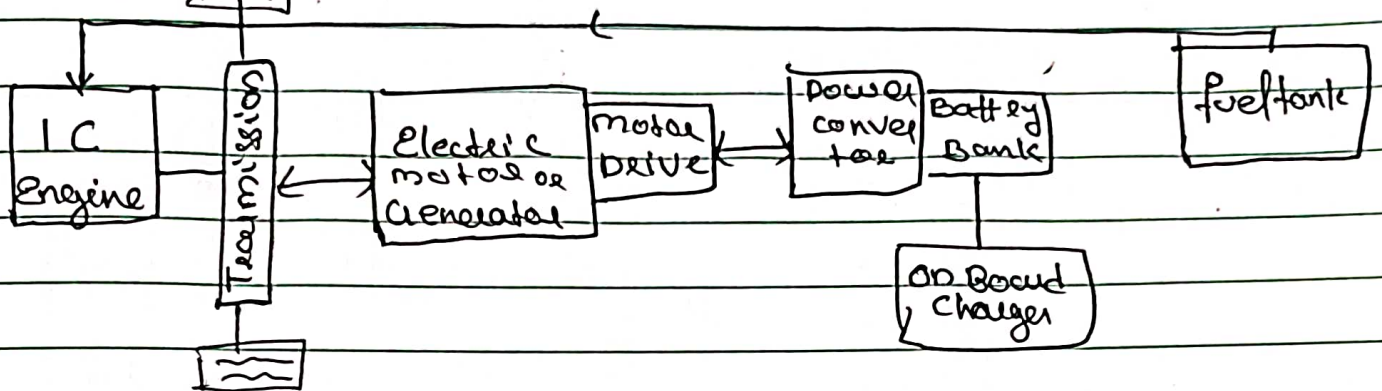
- * very bulky, less space.
- * very complicated
- * high weight.

Application

- * only Toyota prius using this engine.

App

Plug in Hybrid E.V.



* IC Engine is ~~works independently~~ ~~independent~~

* the battery packs are charged by supply.

* the battery also charged by IC engine & by using generator

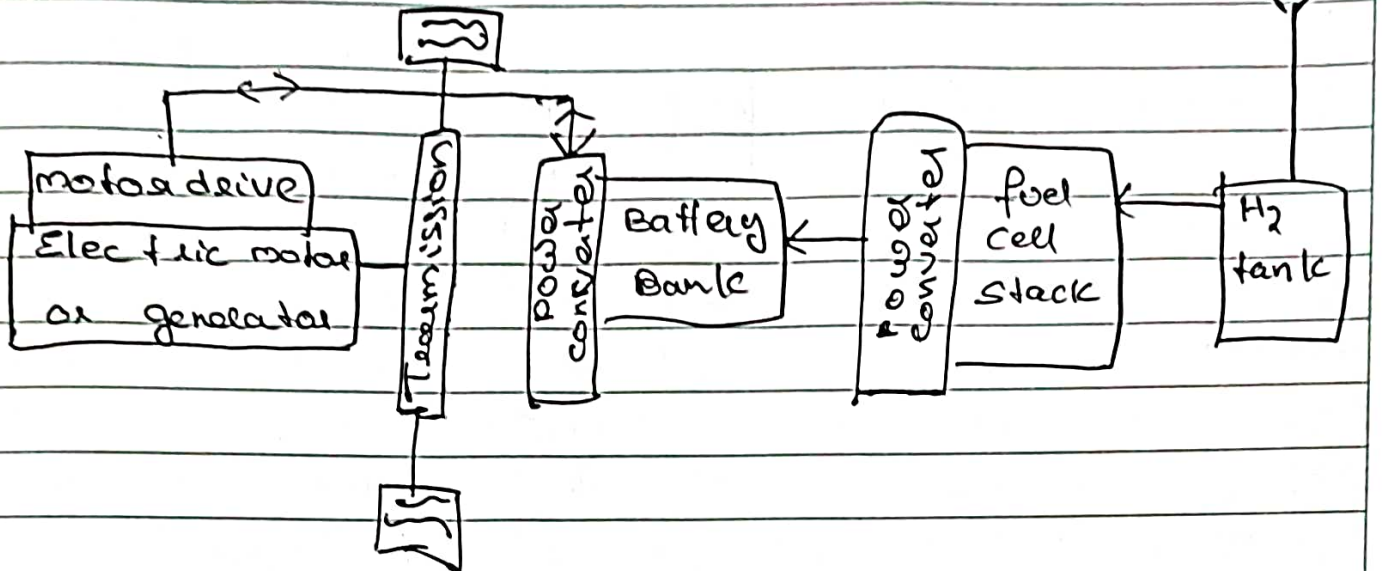
Advantages:

- * fuel efficiency in traffic.
- * Easy to drive.

Disadvantages

- * ~~fuel~~ very expensive.
- * complex to maintain
- * Battery life concerns.

Fuel cell E.V.



In fuel cell the IC Engine is the series. hybrid vehicles is replaced by fuel cell. Engine which hydrogen is the fuel and produce electricity to recharge ~~the~~ battery.

Advantages

- * Efficient than IC Engine
- * Zero pollution.
- * output is water.

Disadvantages

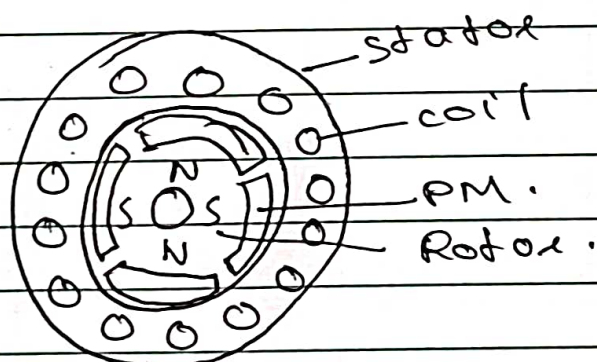
- * Difficulty in handling H₂ gas
- * cost is very high of H₂ gas.

Q3 Explain with diagram the construction & working principle of brushless motor BLDC

construction.

The main design difference b/w a brushed and brushless motor is the replacement of mechanical commutator with an electric switch ckt. Keeping that in mind, a BLDC motor is a type of synchronous motor in the sense that the magnetic field generated by the stator and the rotor revolve at the same frequency.

3 phases BLDC is common.



working principle.

BLDC motor works on the principle similar to that of Brushed DC motor. The Lorentz force law which states that whenever current carrying conductor placed in a magnetic field it experiences a force. As a consequence of reaction force, the magnet will experience an equal and opposite force.