Assignment - 1

Electric Vehicle design

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Q1. Explain the journey of automobile with the help of flow chart from the beginning of 18th century to the 21st century & give brief description on the following milestone in the Automotive.

a) Invention of electric motor
b) Golden era of EV
c) Domination of electric vehicle by gasoline cars
d) Coming of new era in EV
e) Introduction of hybrid vehicle.

Answer

The Journey of Automotive

- 1796 → Origin of steam engine.
- 1806 → First ICE on fuel gas
- 1837 → First successful electric locomotive
- 1896 → first successfull electric vehicle
- 1912 → peak production of EV.
- 1924 → Domination by gasoline cars (1924-1960)
- → concept prototype and serious design of E.V

Golden age of EV (1837-1924)

1970 → Limited production of e.v

1980 → Incoptrate technology advanced to ev design

1990 → first generation of e-v

2000 → hybridised ev and increasing level of gas supply down

a) invention of electric motor - in 1828 the hungarian inventor Anyos Jedlick invented an world's first electric motor and created a first small model car powered by his electric motor.

b) golden era of ev :- the golden era of ev is from 1837 — 1924 in 1837 first electric locomotive invented. and in 1912 the peack production of electric vehicle started to 1924 so this era known as the golden era.

c) domination of electric vehicle by gasoline cars - from 1924 - 1960 Domination of gasoline cars has started in 1912 Petrol powered cars became easier to drive due to the invention of Charles Kettering and his electric Starter, electric cars began lose their position in the car market at America in 1920, EV was dominated by gasoline cars.

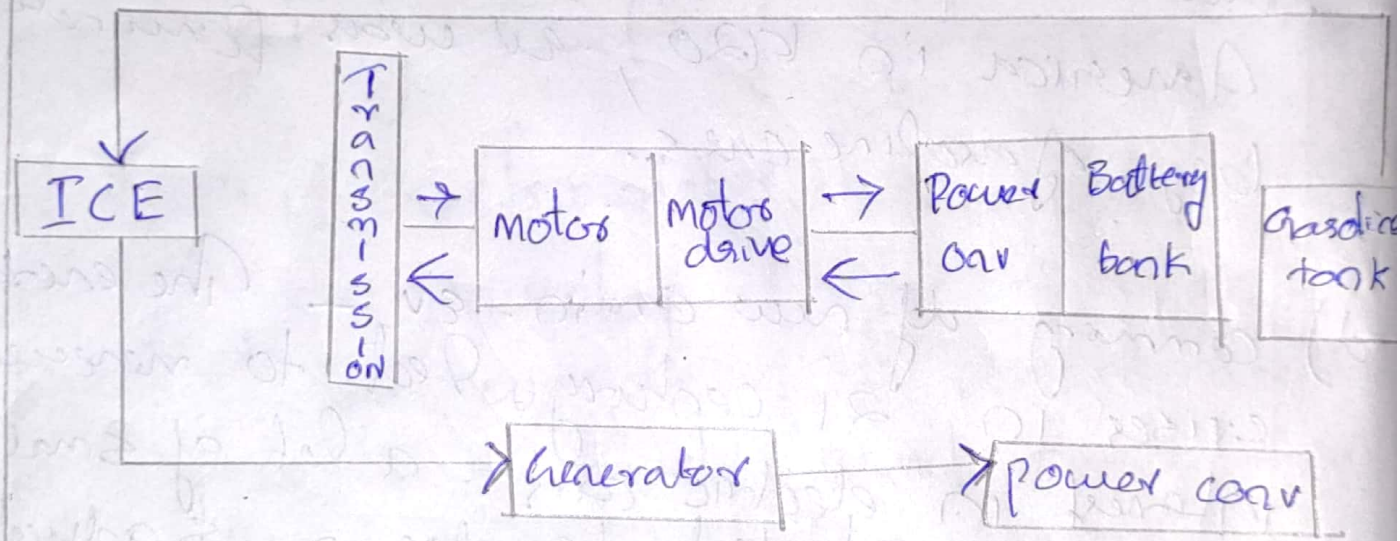
d) coming of new engine - EV — The energy crises in 21 century led to increased interest in electric cars. a lot of small companies started to design & advertise electric cars to the public, Toyota offered its RAV4-EVS in year 22nd Nov 2002 California manufactural of EV Tesla motors in 2004 started the development of the Tesla Roadster model this is comming of new era in EV

D) Introduction of hybrid vehicle - hybridised EV and increasing level of gas supply demand so vehicle companies started

hybrid EV's

Q2 Explain and draw the layout of the following hybrid EV with their two advantages, disadvantages & Application in Automotive segment.

a) Series hybrid E.V

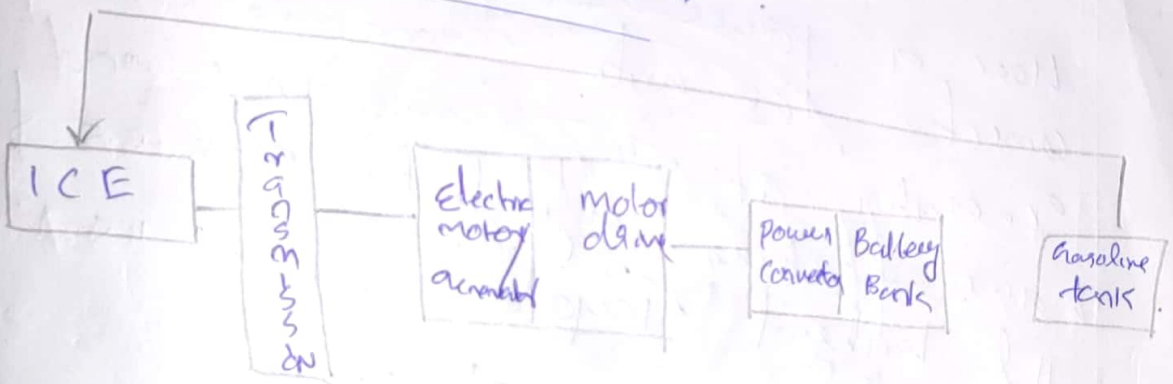


Series hybrid electric vehicle is an electric vehicle which is assisted by an ICE the transmission system doesn't have direct connection with the ICE when the EV needed extra power the generator connected to ICE starts producing electricity which is then used for charging batteries with the help of a power converter. If how it could according to the driving condition, normal driving rough road driving breaking and vehicle at stop.

Advantage - the ICE has to operate in its narrow optimal region and it has ready ideal torque - speed chara.

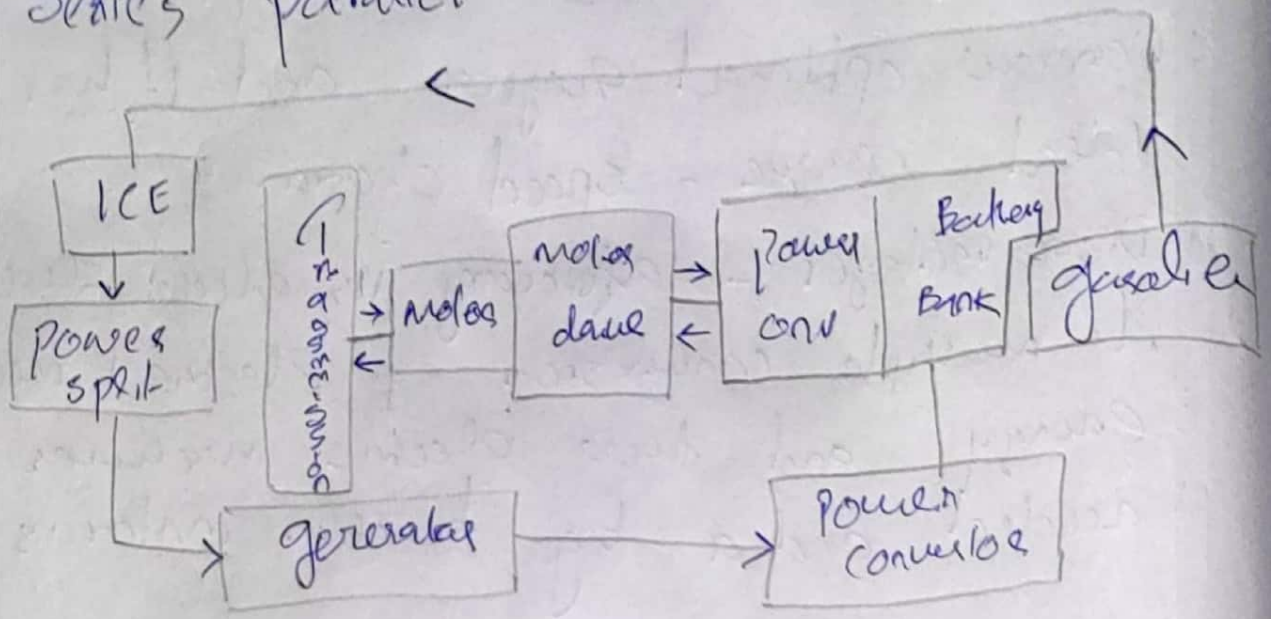
Disadvantages - efficiency is reduced due to multiple conversion of electrical mechanical energy and two electric machines are needed and a big traction motor is required

b) Parallel hybrid vehicle



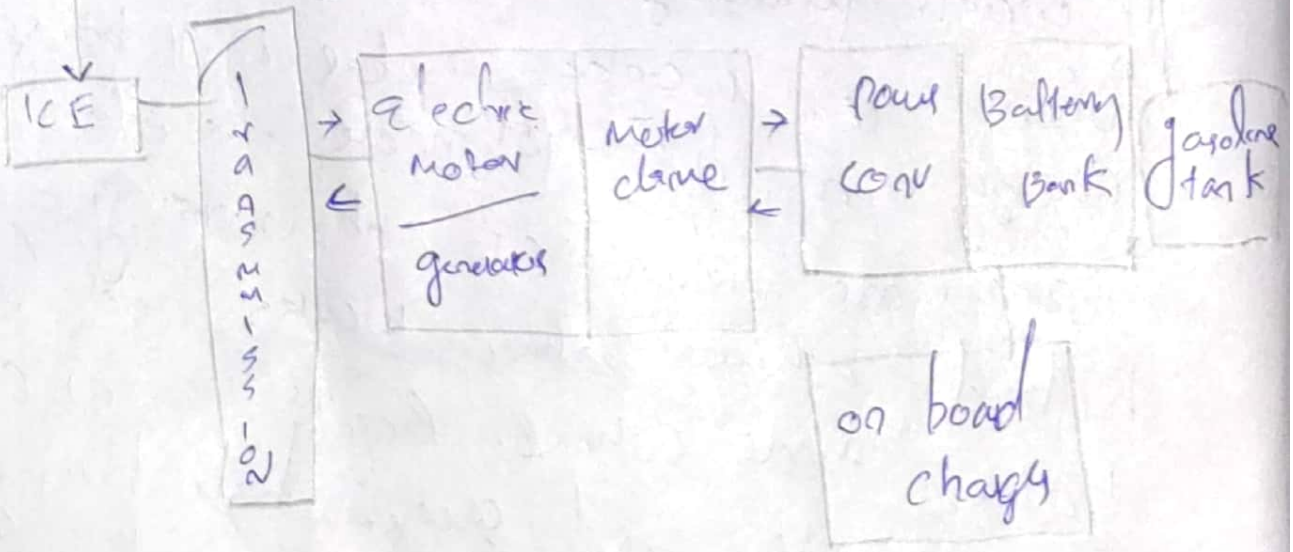
Here both ICE and electric motor has connection with transmission system makes, it works parallelly. There is has 5 modes when IC works motor will be generating energy in the 1st mode, the electric drive mode where ICE not working and hybrid where both works and low battery mode where engine is in charge & drive mode and regenerative braking. compared to series hybrid drive

c) Series parallel HEV



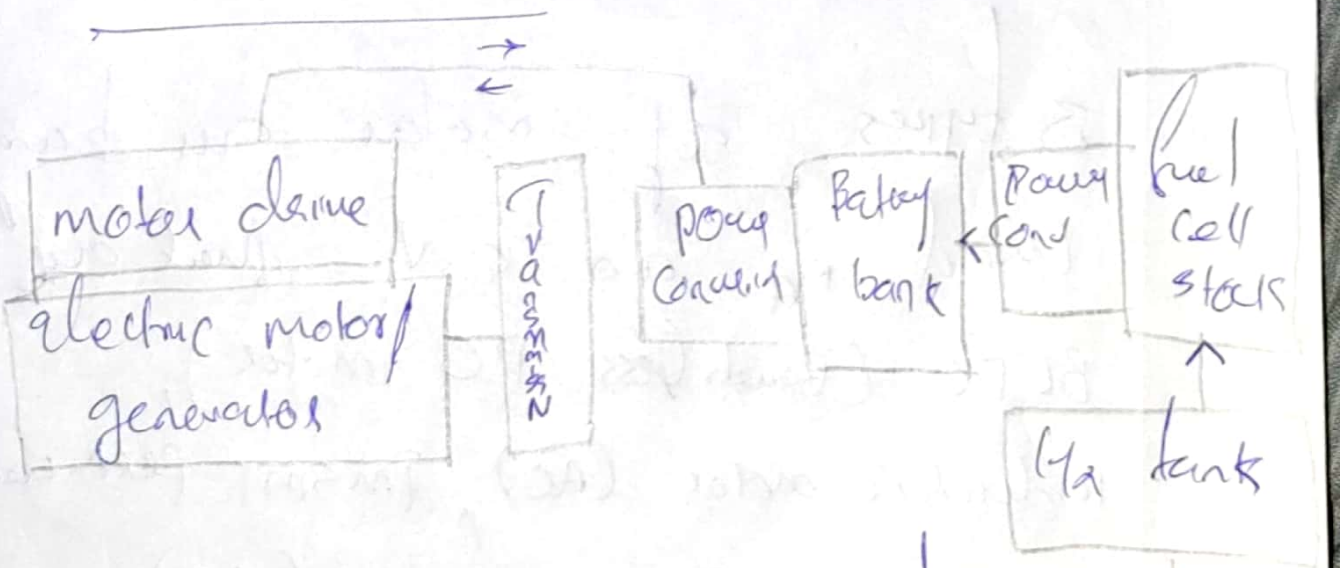
Here a power split is used to connect ICE with transmission & generator at the same time and have features of both series & parallel hybrid Toyota Prius is 1st model

d) plug in hybrid PHEV



In this type of HEV there is no direct or indirect connection of ICE with motor like ICE cannot be used as a generator to charge battery. but there is an on board charger to charge the battery bank the main advantages of PHEV are zero emission on battery while driving. It is relatively expensive & complex to maintain battery Quf concerns

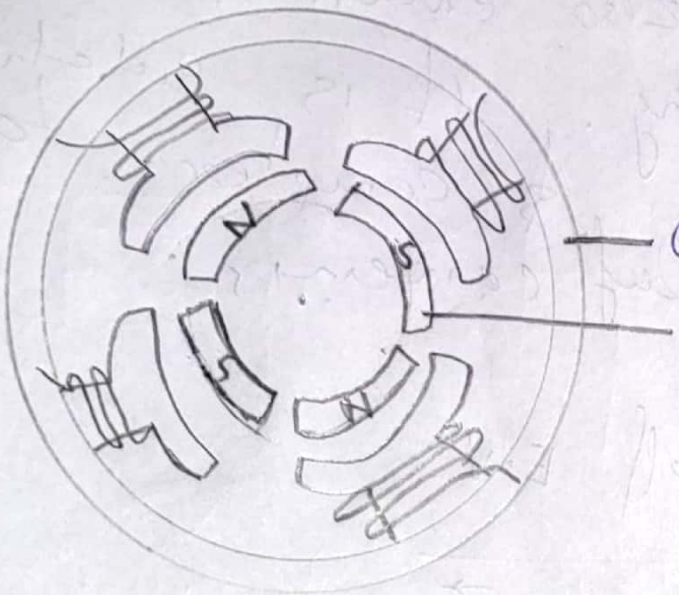
c) Fuel cell E.V



in FCEV H_2 gas is used as a fuel cell stock to propel

electricity to charge battery for running motor. here motor is only connected to transmission and acts as brush moto-generator

q3) Explain with diagram de construction & working principle of BLDC motor.



3 types of motor are being used in a e.v that are BLDC (Brush less DC motor), induction motor (AC), PMSM (Permanent magnet Synchronous motor (AC)
As the name says BLDC motor

doesn't have brushes thus reduces heat losses by brush the efficiency range of BLDC motor is min 85% to 95% & it costs 3 times more than BLDC motors are known to be the highest efficiency motor with weight range of 0.3-0.4 kg weight since If it is 0.4kg it weight these type of motor are used in 2 wheeler & 3 wheelers

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