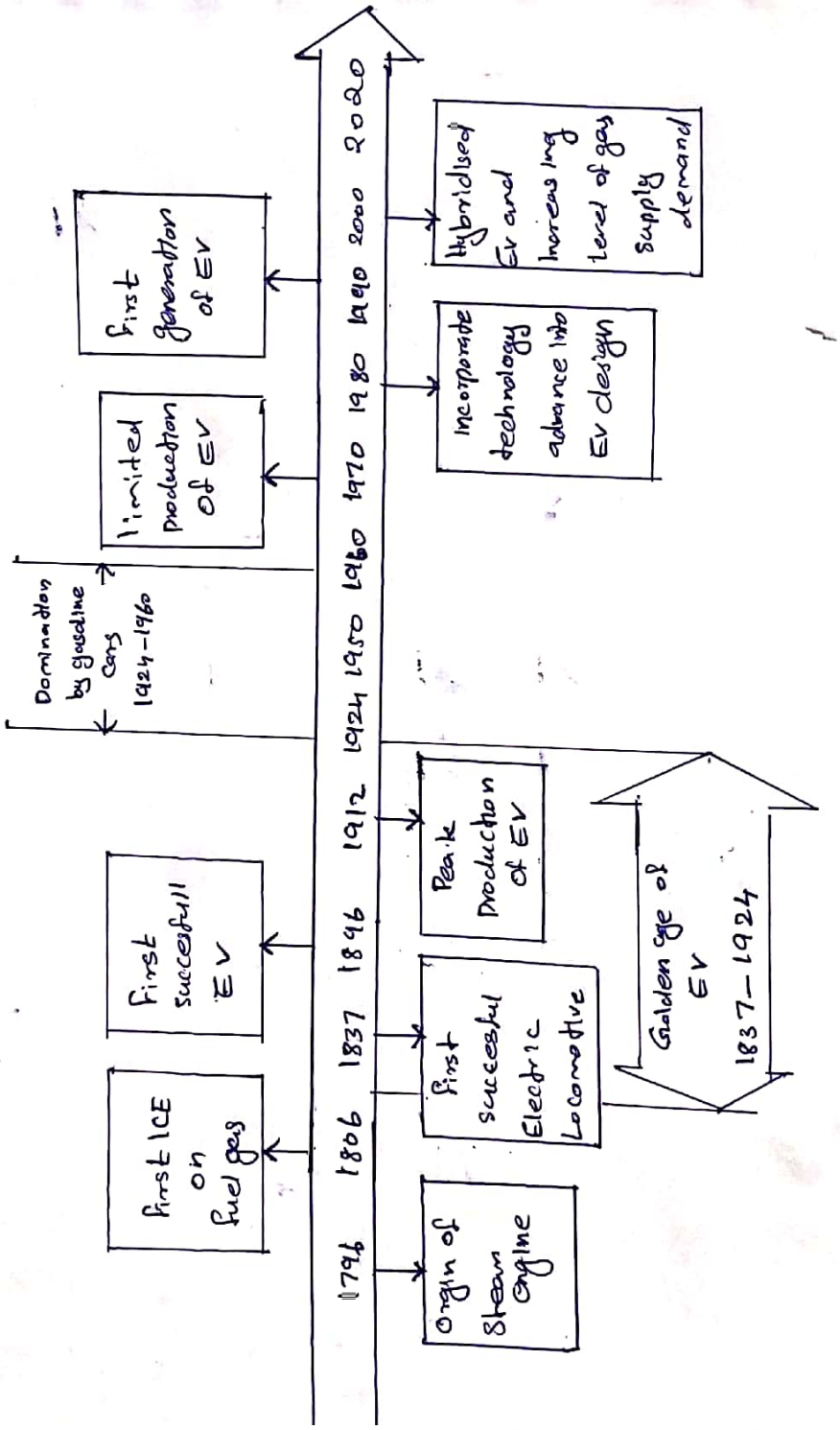
Assignment

Q 1) Explain the journey of automotive with the help of flow chart from the Beginning of 18th century to the 21st century a give brief description on the following milestone in the automotive Journey.

a) Invention of Electric motor
b) Golden era of EV
c) Domination of Electric vehicle by gasoline car
d) coming of New era in ev
e) introduction of hybrid electric ~~vehicle~~ vehicle

A)

The Journey of Automotive



The development of automobile is started in 1672 with the invention of the first steam powered vehicle, which leads to the creation of the first steam powered automobile capable of human transporting, It was invented by Nicolas Cugnot In 1769. It is also known as fradeour's de vapore. It is the first registered automobile with steam driven. It is used by french army and can carry 4 tonnes, In 1806 Isaac de Revaz invented First Ic engine vehicle during 1806, the engine is worked by the gas as fuel. In 1828 Anyos Jedlik Allead a patent for Electric motor, It is displayed the utility of toy car prototype & he also shows another application that there no need of exhaust for emission. as the evolution looks in 1865 Electric trams has be used in spain It is known as trams of Birmingham. It is an milestone. & In 1884 - the proclaction in automobile field began by using the Ic engine. by carl Benz. In 1886, In England the first electric vehicle undergo production by Thomas Parker, in 1890 morrison carriage is invented. It was invented by

William morrison, which can able to carry 5 people, His speed is ~~20 mph~~ 32 km/hr at 58V, 112 Ah Battery & 4 Hp motor, & then in 1906 → Fritchle electric is invented, in a single charge it can attain a range of 100 miles & the top speed of this vehicle was 45-50 km/hr. His known as advance ev vehicle model of that time. the reason for getting popularity for ev vehicle in 1906 is in electric vehicle there is no emission, it is easy to start & it is low cost & efficient, 1910 is known as the golden era for ev vehicle because after this the ev become get declined. In 1912 cheverlet come with self start mechanism for IC engine, so the main draw back of starting time is solved by this, it made emergence of IC engine vehicles. In 1912, ford firs model T- has came with electric starter & gas powered vehicle like wise in 1920-35 Electric vehicle become totally declined & then in 1973 general motor derelope a prototype of an urban electric car. & in 1999, first mass production of hybrid Toyota prius started. It is the come back point of Ev vehicle. the first model was sedan, & in 2006 - at santa monica Auto expo Tesla roadster was displayed as an ev model, people went crazy to bay this vehicle. Roadster was an speed vehicle in ev range of 100-150, so that the other company become made so the GM clims that with their technical experiance the ev vehicle is not possible. But in 2010 → Nissan leaf is introduced It is the first 5 door affordable ev hatch back with rang of 110 mile. this model get well acceptance from people Tesla proved ev vehicle is possible through Prototype & Nissan leaf proved that it could be affordable to the customers, the Tesla Roadster & Nissan leaf has transformed the industry with in short time period, & Here start energence of EV.

a) Invention of Electric motor

In the case of automobile field the first vehicle was powered by steam engin, then it converted by Ic engine by Isaac, But the main problem in these two engine is that there takes a lot of time to start the engine as for starting there need a person with mechanical knowledge, also these engine has high amaund of emmission also which leads environmental problems these draw backs made thiele of an electric motor. these all draw back can be resolved By an electric motor. ~~An in 1885~~ An electric motor is an electric machine that converts electric energy into mechanical In 1828 - Anyos Jedlik from Australia, He filled a patent for electric motor, ~~the~~ By displaying the utility of the Toy car prototype he patented, also showing the other application of same prototype he filled other patents also., the main attraction of this is there is no need of any exhaust for emission. His prototype ~~is~~ just condain 3 components of practical DC motor, It is stator, Rotor, & a commutator. From his this prototype the evolution of electric motor starts. from ~~to~~ this basic idea the DC & Ac motors are invented.

b) Golden Era of EV

Golden age of electrical vehicle is marked from 1890 to 1924 with peak production of electric vehicles in 1912. the range was limited by energy storage in the battery. these period is considered as golden age is be cause of tremendous evolution took place in case of ev vehicle.. Thomas parker's high capacity Rechargable battery pack and electric car was the starting. He undergos the production of ev. & then William morrison invented or builds his 6 passenger electric car, after that in 1896 the invention of ~~elect~~ electric starter motor for gasoline engine makes them more practical and convienient for consumer.

In 1901 porshe developed the first electric hybrid of the model.T ford sparks the begning of the end of golden age. this model get more popularity. at that age because of efficency, cost, No emmission, of easy start, after this golden age ev vehicle start declinined.

c) Domination of Electric vehicle by gasoline car

Better roads and discovery of cheap Texas Crude oil help contribute to the decline in electric vehicle. the first reason is Henry ford come with Assembly line production. He made 30% reduction in cost of IC engine. the manufacturing difficulty also less in ic engine. Because battery of ev is much compliicated and difficult process and also there is risk. Reason 2 is chevrolets they came with self start mechanism for ic engine. so that the main draw back of starting time of mechanical knowledge is resolved. the 3rd reason is world war. there are 2 major problem in ev that is Range of charging time. In case of ic engine we can able to carry extra fuel. then Harly davinson, they made the coustomer to adapt within the motor cycle, they teaches to maintain & repair the motor cycle of military used for escape from war field of that made the trust with Harly to make market.

In 1928, oil lobby is us face fuel defficiency so the government gave the charges to private sector of they made an power on economy. they can able to change the market towards the gasoline field. These are the reason for ev run's out of market.

d) Comming New era of EV

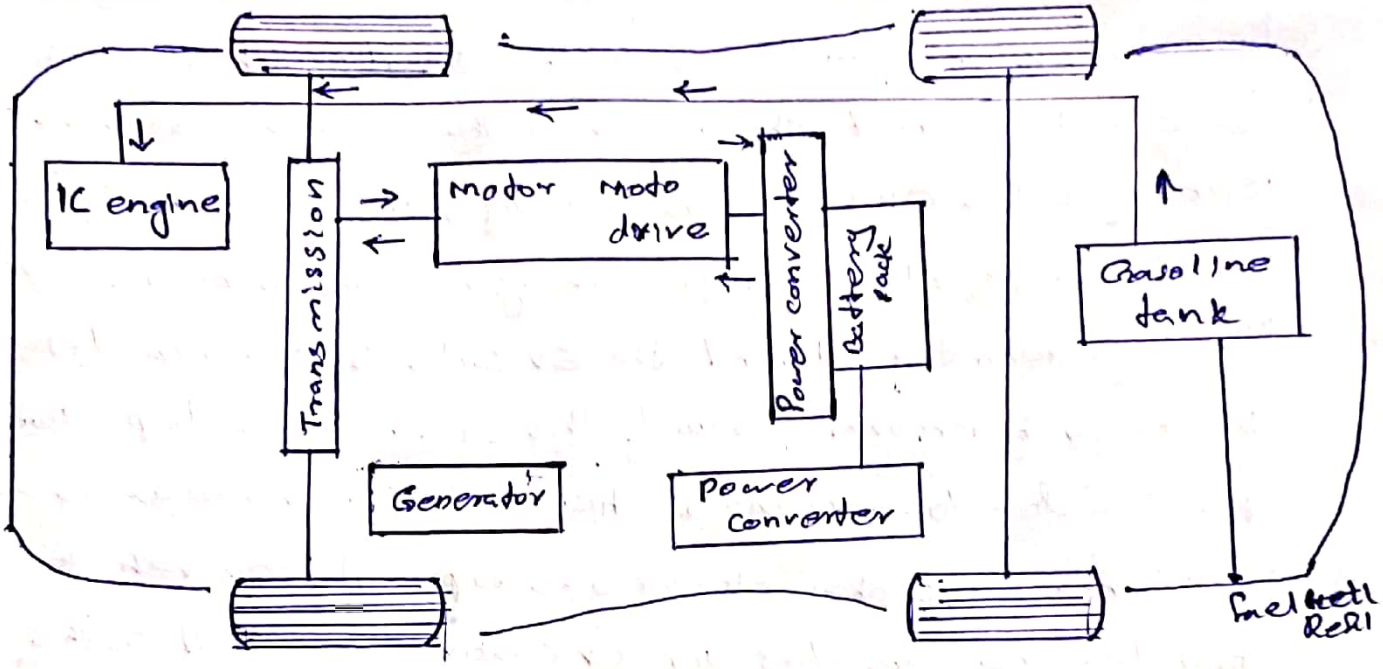
after 2010 Ev many Market become grow. In 2011 40k sale are there. Because the many countries came to know that the drawn backs of the gasoline vehicles, so many environmental issues are began so for resolve this they came back to ev. It was in the starting China has the more sale in the market. the reason for the emergence is china gives subsidy to the ev customers year by year. the subsidy provided for 2 years, & also Total price margine.. attain before 2 years. the major factor that depend the EV sale is the subsidies provided by the gov by removal of subsidy the sale become drop. But at the period of lockdown many of the countries came to aware about the California smog. they also become to promote ev vehicle and also provided the subsidies for ev customers as well as the EV production companies. by Green Credits. In india also sale Increased, But the major reason for in the case of India was the raise in the cost of petrol rate this made rise in EV market

e) Introduction of hybrid electric vehicle.

Hybrid electric vehicle may defines the Combination of conventional internal combustion engin (ICE) system with an electric propulsion system, the presence of electric powertrain is intended to achieve either better fuel economy than conventional vehicle or better performance. In Hybrid EV, there is efficiency and effectiveness of vehicle will more. The most common HEV is the hybrid electric cars. It is very usefull to efficiency Improvement technology with regenerating breaking. IC engine which will also help to change the battery pack.

Q)2 Explain & draw the layout of following hybrid electric vehicle with their two advantages, Disadvantages & Industrial application. in automotive segments.

A) a) Series hybrid electric vehicle.



Series hybrid EV which IC engine is not directly connected to transmission. The IC engine which may directly connected to Generators and also power converter which may help to change the battery part and which battery may connected to motor & motor will drive the vehicle to transmission. this made vehicle drive.

Advantages :- i) Mechanical coupling blw the ICE and driven wheel allows the IC engine operating at its very narrow optimal region.

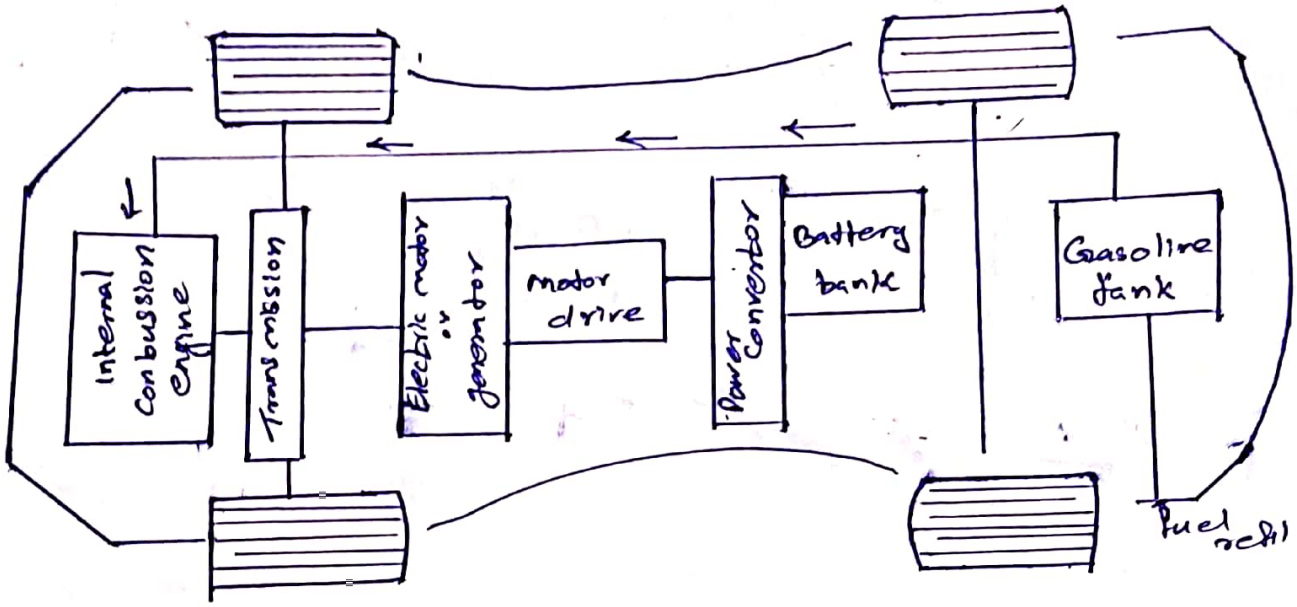
ii) Nearly ideal torque - speed chara of electric motor make multi gear transmission unnecessary.

Disadvantages :- i) It reduces efficiency due to energy is converted into twice.

ii) Two electric machines are needed and a big traction motor is required because it is the only torque source of the driven wheel

Industrial application :- Serial hybrid is used in BMW i3

b) Parallel Hybrid vehicle.



IC engines of vehicle fitted with a powerfull electric motor to assist the engine. In this IC engine will be more powerfull, Because of the parallel operation the battery pack will be small when compare with series. A parallel hybrid is propelled by both an IC & an electric motor connected to a mechanical transmission. Power distribution blw the engine and the motor is varied so both run in their optimum operating region. as much as possible. there is no seperate generator in parallel hybrid.

Advantages :- i) Both engine and electric motor directly supply torque to the driven wheels and no energy from conversion occurs, hence energy loss is less

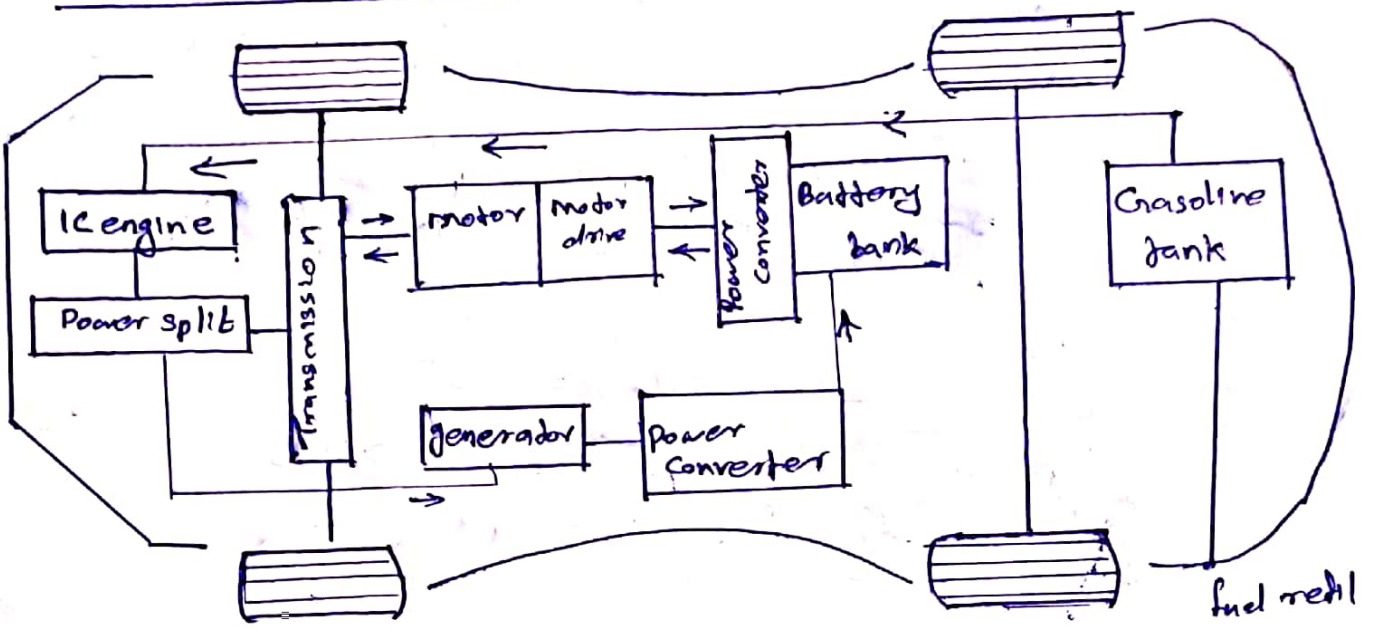
ii) Compactness due to no need of the generator and smaller traction motor.

Disadvantages :- i) Mechanical coupling blw the engines and the driven wheels, thus the engine operating points can't be fixed in a narrow speed region.

ii) The mechanical configuration and the control strategy are complex compared to series hybrid drivetrain.

Industrial application :- used in BMW i8

c) Serial parallel hybrid vehicle.



In this motor is directly connected to the transmission. Ic engine connected to generator. It works as series: But also blw Ic engine a generator there is an powersplit Section it serves Ic engine works on both generating and charging battery and also it support transmission divide the Power blw generator & Transmission. when battery is fully charged the Ic engine power will transmitted to Transmission and when battery is low the Ic engin works for battery Charging. the third case is this condition can be done simultaniously. this combination is only used in Toyota Pries, Because it is really bulky & difficult

Advantages :- i) combines the advantages of series & parallel hybrid

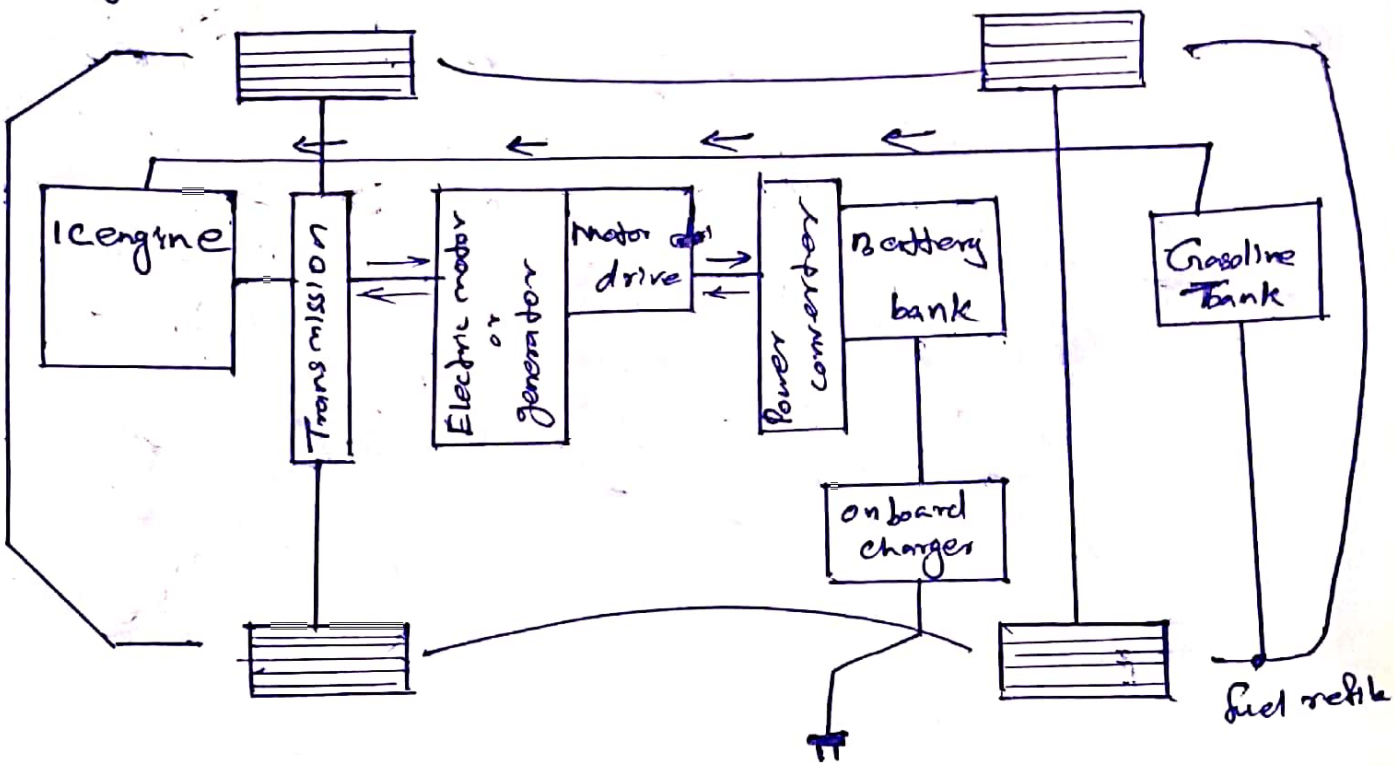
ii) more effectiveness and high efficiency

Disadvantage :- i) Design is looking complex than others control mechanism also

ii) the vehicle will be Bulky due to combinations

Industrial application :- this is only used in Toyota pries.

d) Plug in hybrid electric vehicle.



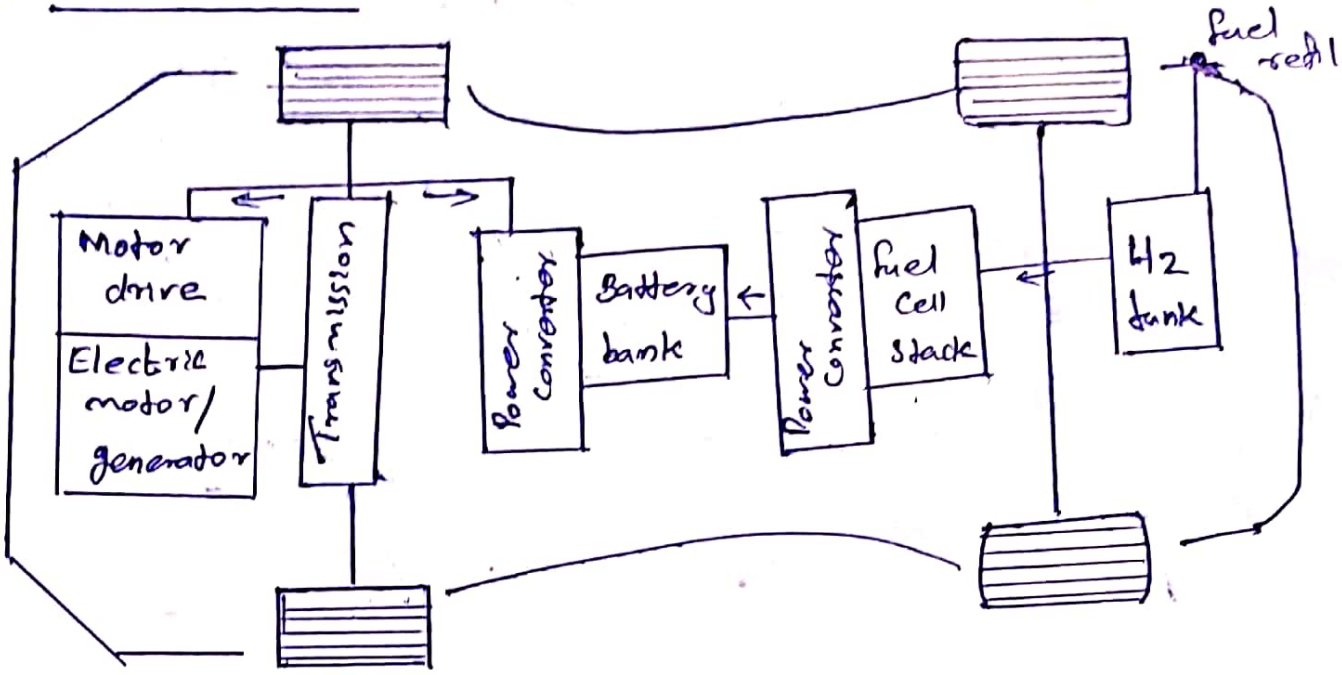
In plug in hybrid the function is same as the hybrid but the only change is there is an on board charger plug is for charging. other ~~working~~ working as same there is a plug to recharge the battery pack.

Advantages :- • fuel efficient in traffic
• Zero emission while drive in battery

Disadvantages :- • relatively expensive & complex to maintain
• fuel economy not very good on motorway journey

Industrial application :- automobiles, Buses.

e) Fuel Cell Ev



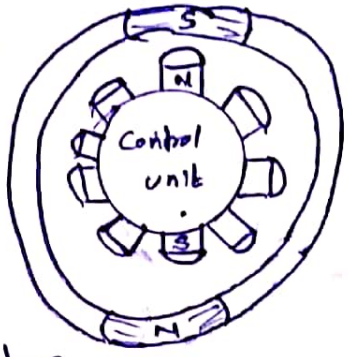
In fuel cell EEv there is no IC engine is used. Here instead we use fuel cells that generate electricity. ~~Here to do~~ we have to refil it at hydrogen charging station. In this the power is generated by the reaction with oxygen and water and heat is produced as byproduct.

Advantages :- • Less fuel consumption and high efficiency
• less pollution.

Disadvantages :- • Difficult to transportation
• High cost.
• difficult to handle

Industrial application :- • used in Rockets
• Used in Cars or automobiles.
• ~~Used to satlights~~.

3 Q) Explain with diagram the construction & working principle of BLDC motor

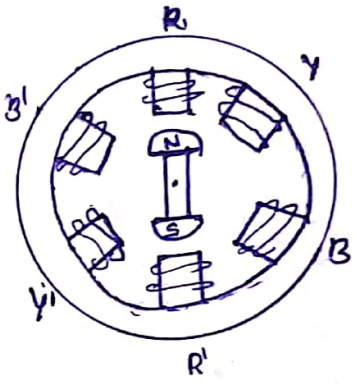
A) 

It is the one of the popular Motor in the industry and automotive, the high efficency that has provided by BLDC motor give the motor used often by large scale. the BLDC motor has high standard of opteration it used in various application. BLDC motor has no brushes so, It can operate at high speeds with high efficiency, and it also bear better heat dessipation. when compared with other motor. BLDC motor has an ideal part of modern drive technology for actuating ev drives.

BLDC motor have traction chara like high starting torque. and high efficiency. It has maximum efficency and minimum efficency of 95% & 85%. It has weight of 0.3 - 0.1 kg this mostly less than other motors. It can be used for high level application because of its power production It can produce 15kw of power. BLDC motor also known as trapizodial permanent magnet motors. It is permanent magnet synchronous electric motor which is driven by direct current (DC) where the brushes makes mechanical contract with Commutator on the rotor, so as to form an electric path. b/w a DC source & rotor armature windings. the electric commutation with peramenb magnet rotor and the stator with a sequence of coil in this motor rotate and current carrying conductors are fixed. The electronic Commutation arrangement eliminates the commutator arrangement & brushes in BLDC motor hence reliability of motor

Increases and it is only produce less noise when operating.

Construction :- It is made up of stacked steel laminations with axial cut slots for winding. The BLDC winding are slightly different that of traditional induction conventional motor. Stator windings that are connected in star. Rotor magnet used is peranent magnet.



Working Principle:- The BLDC motor works on the lorenze force ~~principle~~. It state that when ever a current carrying conductor placed in a magnetic field it experience equal & opposite force or torque. the direction of motion varies continously with time in BLDC. This variation is due to the voltage & current.