Questionaires

1) Explain the journey of automotive with the help of flow chart from the beginning of 18th century to the 21st century & give brief description on the following milestones in the automotive.

-: The journey of Automotive industry starts in the 18th century with the worlds first invention of Electric motor by Anyos Jedlik, which is then used for his first small model car. As a continuation of this invention Automotive industry got developed and took further steps ahead. Invention of crude elecoric carriage, small scale elecoric car powered by non-rechargeable primary cells and building of first known elecoric locomotive were the major inventions in ~~us~~ eighties.

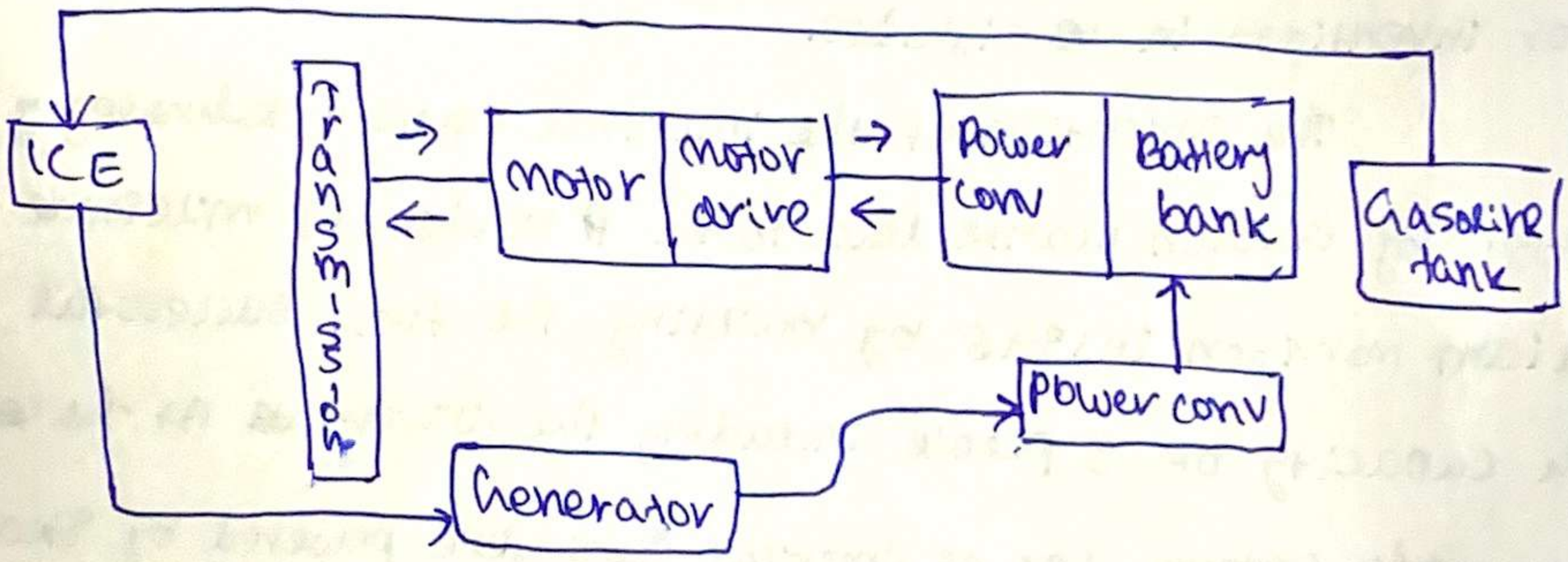
The invention of the improved battery technology in france in 1881 by Gaston plante lead to the reaching of milestone for William morrison in 1896 by building the first successful E.V with capacity of 3 people including the driver ~~in~~ At the ~~century~~ turn of the 19th century, 40% of American cars were powered by steam, 38% by electricity and 22% by petrol. commercial electric vehicles were produced primarily in Europe.

Electric cars began to lose their position in the car marked of America in 1920 because of the invention of elecoric starter for petrol powered cars and EV was dominated by gasoline cars by 1924-1960 The energy crisis in 21 century led to the new era of E.V, lot of small companies started to design and advertise elecoric cars to the public

Then in the year of 22nd november 2002 toyota offered its RAV4-EVS and in 2004 Tesla motors started the developemend of Tesla roadster model which is then delivered in 2008.
In 2002 many MNC companies had taken initiative for green mobility and Ev vehicles such as TATA motors, kinetic green, mahinar a electric are such of them

2) Explain and draw the layout of the following Hybrid EV. with their two advantages, disadvantages & industrial application in automotive segment?

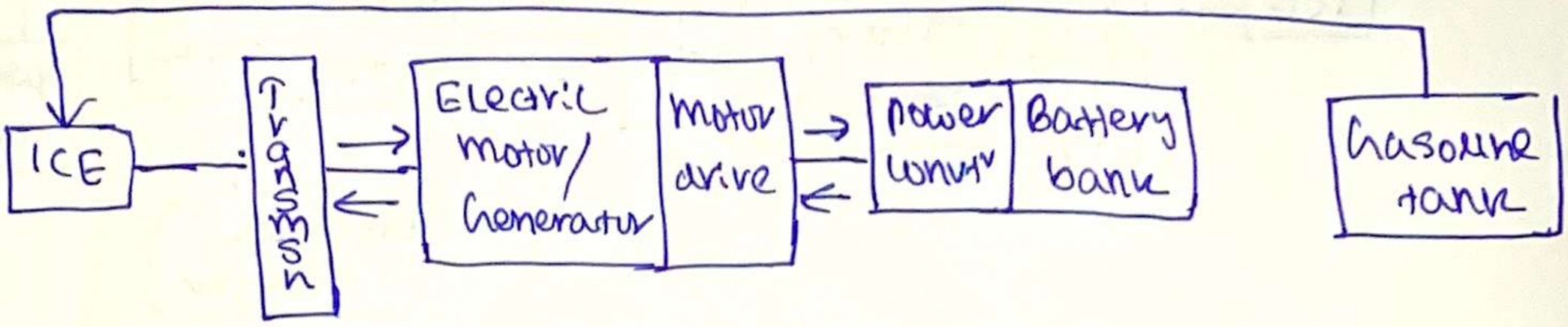
a) series hybrid E.V



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 the ICE starts producing electricity which is then used for charging battery with the help of a power converter. which is then converted and controlled by motor drive.
It has 4 cased according to the driving condition. Normal driving, Light road, during braking, and vehicle at stop

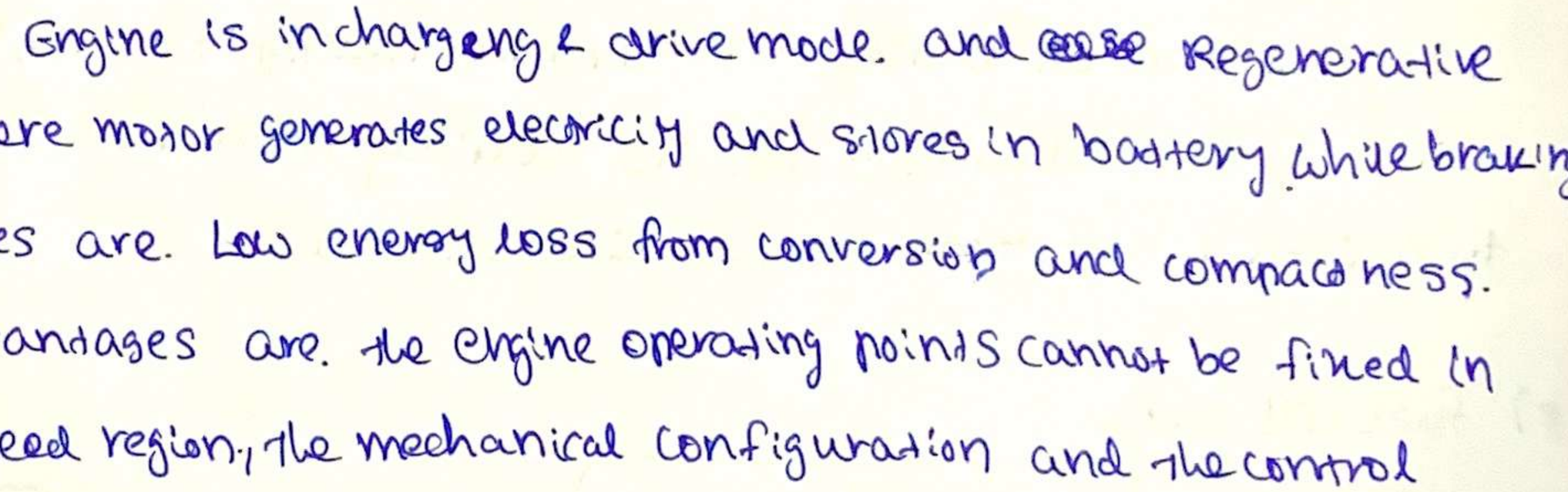
advantages are, the ICE has to operate in its narrow optimal region. and it has nearly ideal torque-speed chara.
and dis advantages bare the efficiency is reduced due to the multiple conversion of elecorical-mechanical energy. and two electric machines are heeded and a big traction motor is required.

b) parallel hybrid vehicle.



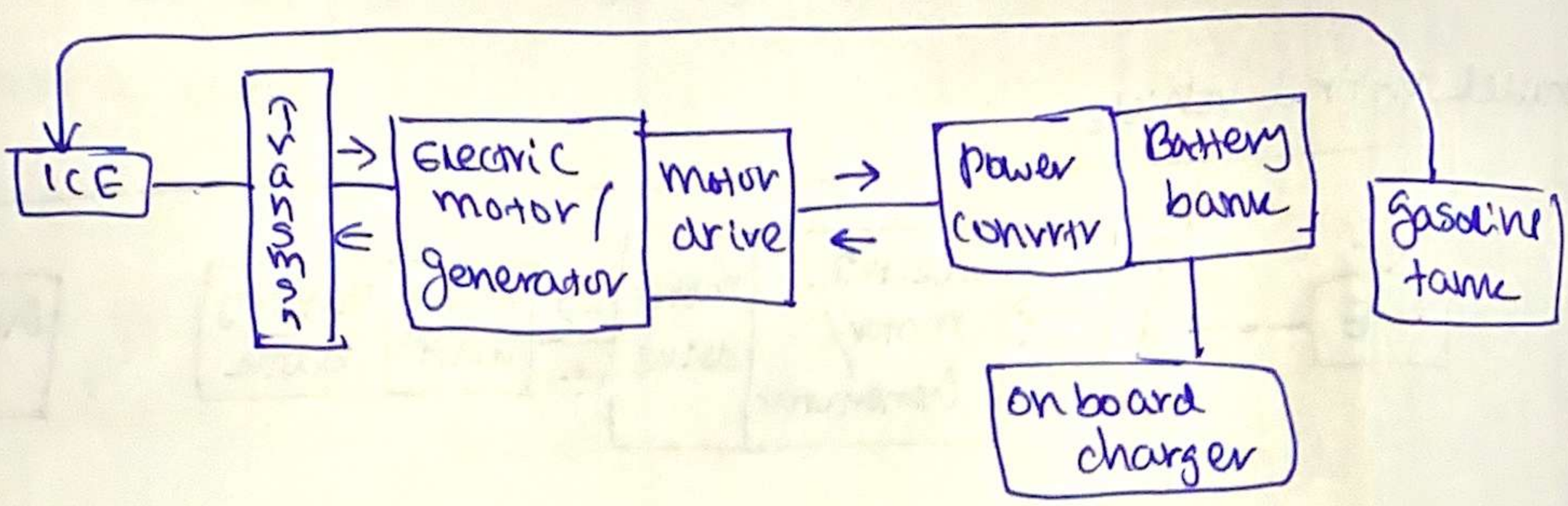
Here both ICE and Elecoric Motor has connection with transmsh system makes it work parallely. Here it has 5 modes. when ICG works motor will be generating energy in the 1st mode, the Elecoric drive mode where ICE not working and hybrid where both works and Low battery mode where Engine is in chargeng & drive mode. and Regenerative braking where motor generates elecoricity and stores in battery while braking. the advantages are. Low energy loss from conversion and compactness. and disadvantages are. 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 drivetrain.

c) series parallel HEV



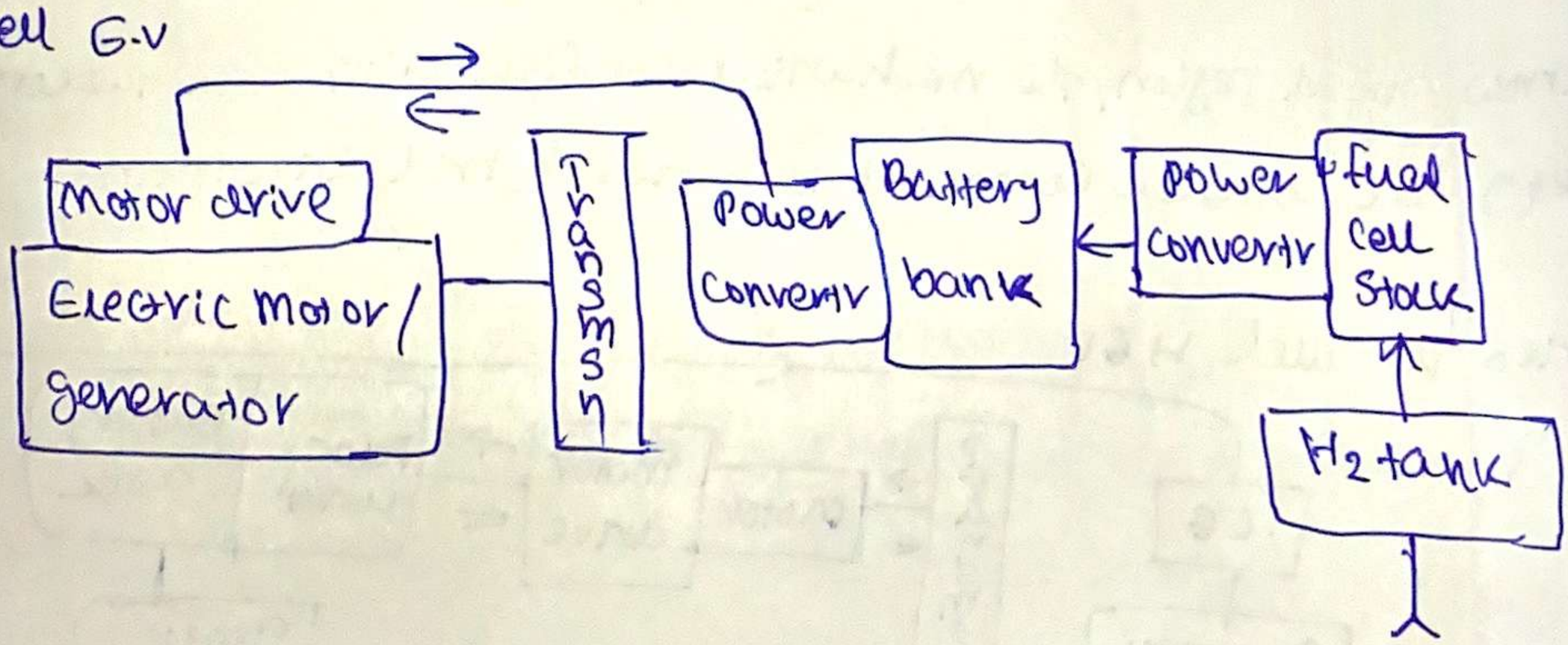
Here a power split is used to connect ICE with transmission and generator at the same time and have features of both series and ||el hybrid. Toyota prius is the first model.

d) plug in hybrid e.v



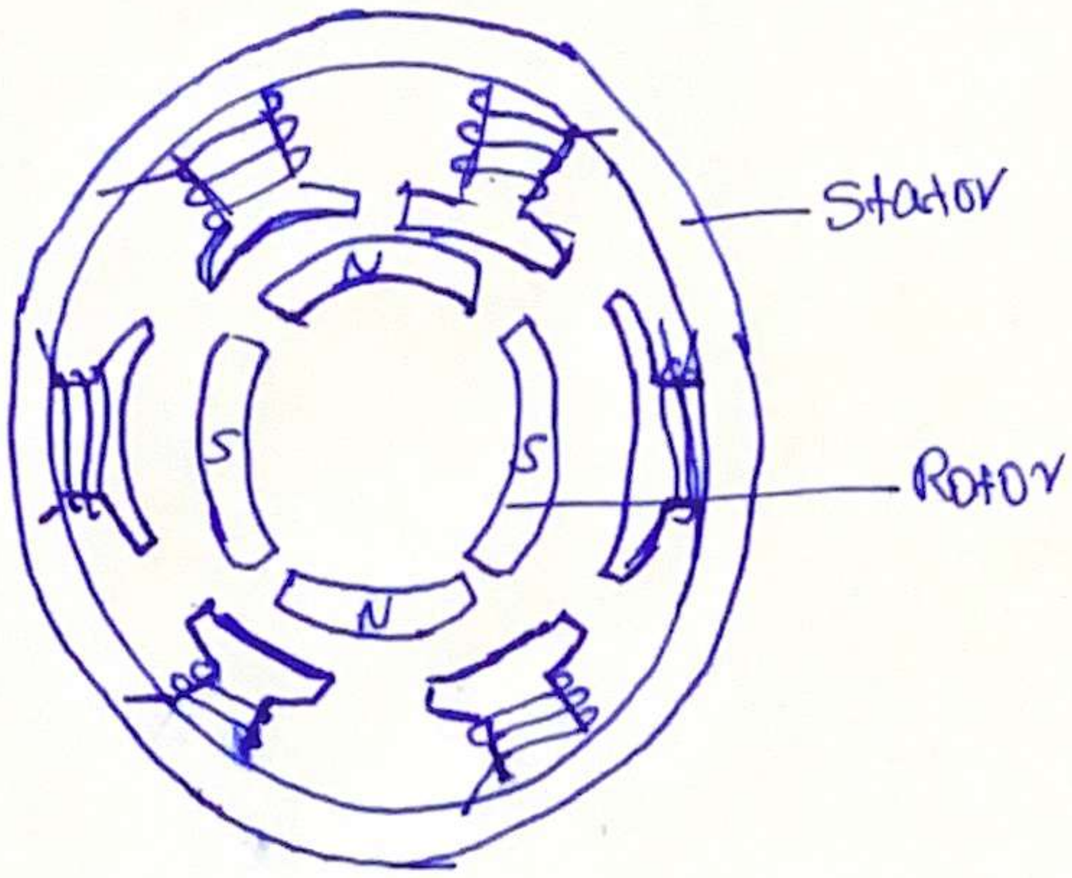
In this type of HEV there is no direct or endirect connection of ICE with motor like ICE cannot be used as generator to charge battery. but there is an onboard charger to charge the battery bank. the main advantages of PHGV are zero emission on battery driving, fuel etficiency in traffic, easy to drive. and disadvantages are its relatively expensive & complex to maintain. and battery life concerns

e) fuel cell G.V



In FCEV H_2 gas is used as a fuel in fuel cell stack to produce electricity to charge battery for running motor. here motor is only connected to transmission and acts as both motor & generator

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



3-types of motors are being used in an E.V that are BLDC (Brushless DC motor), Induction motor (AC), PMSM (permanent magnet synchronous motor (AC)

As the name says BLDC motor doesn't have brushes thus reduces friction heat losses by brush. the efficiency range of BLDC motor is min 35% to 95%. and it costs 3 times more. and BLDC motors are known to be the lightest among them with the weight range of 0.3-0.4 kg weight. since it is light in weight. these type of motors are used in 2 wheelers and 3 wheelers.